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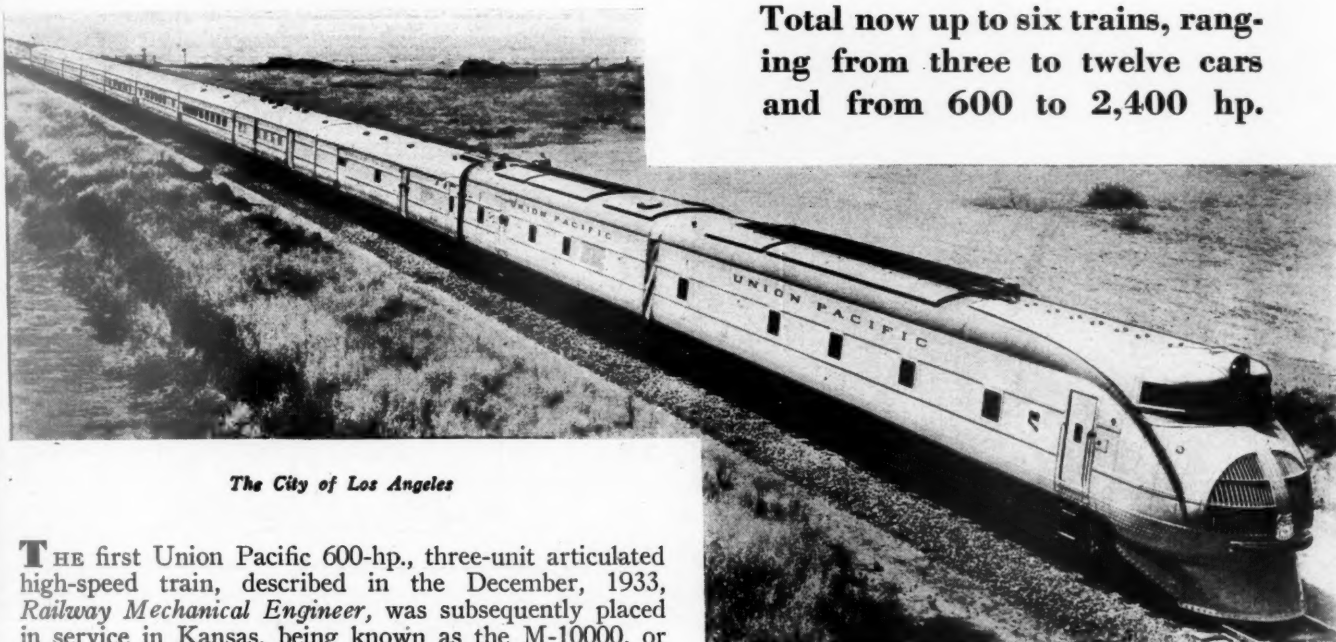
RAILWAY MECHANICAL ENGINEER

Union Pacific

Streamline Trains

Total now up to six trains, ranging from three to twelve cars and from 600 to 2,400 hp.



The City of Los Angeles

THE first Union Pacific 600-hp., three-unit articulated high-speed train, described in the December, 1933, *Railway Mechanical Engineer,* was subsequently placed in service in Kansas, being known as the M-10000, or "City of Salina." In June, 1935, the 1,200-hp. seven-unit train M-10001, or "City of Portland," was placed in service between Chicago and Portland, Ore.; and since May, 1936, four more trains have been placed in service between Chicago and individual western cities, as follows: M-10002, or "City of Los Angeles," consisting of nine body units and a two-unit 2,100-hp. locomotive; M-10004, or "City of San Francisco," similar to the M-10002, but having a 2,400-hp. locomotive; M-10005 and M-10006, the "City of Denver," each consisting of 10 body units and provided with a two-unit, 2,400-hp. locomotive.

All six of these trains, built by the Pullman-Standard Car Manufacturing Company and powered with internal-combustion-engine power plants having electric transmission, are constructed primarily of strong aluminum alloys, with the exception of the use of high-tensile alloy steel for certain castings and Cor-Ten steel for the locomotives on the last three trains. General information regarding the size, weight, seating capacity, power developed and types of cars used in each of these trains is shown in the large table, the scale truck weights on rail of four of the trains being given in a smaller table.

The original Union Pacific three-unit streamliner was conceived with the thought of providing high-speed passenger transportation at minimum cost, and with this objective in view the train width and height were decreased, the center of gravity lowered, the cars articulated and a streamline design selected having smooth, tapered sides which were intended to provide minimum air resistance. It soon developed, however, that, especially for long-distance transcontinental service, the traveling public is not disposed to sacrifice any of the spaciousness, comfort and conveniences to which it has become accustomed in conventional heavy steam trains, and consequently it was found necessary to restore some of the reductions in cross-section area, straighten up the car sides and insert additional cars in the trains providing diner, sleeper and lounge facilities. Referring to the comparative cross-section drawings, this change in trend of design is apparent, the three Pacific Coast trains being 4½ in. higher and 7⅜ in. wider than the original Union Pacific streamliner, and the twin Denver trains 2 ft. 5½ in. higher and 1 ft. $\frac{5}{16}$ in. wider. The latter trains, which represent the last word in Union Pacific streamline train design, are, in fact, slightly wider, both inside and out, than conventional equipment, have equivalent head room inside and yet are 1 ft. 4 in. lower in roof height above rail.

All six of the Union Pacific streamliners are driven by power plants furnished by the Electro-Motive Corporation, with electric equipment supplied by the General Electric Company. Reference to the table will show that the power plant on the first train is distillate-electric, all others being Diesel-electric. All trains are equipped with roller bearings, either SKF or Timken, as shown in the table, and special electro-pneumatic, high-speed train brake equipment is of New York or Westinghouse make.

Referring again to the comparative table, differences

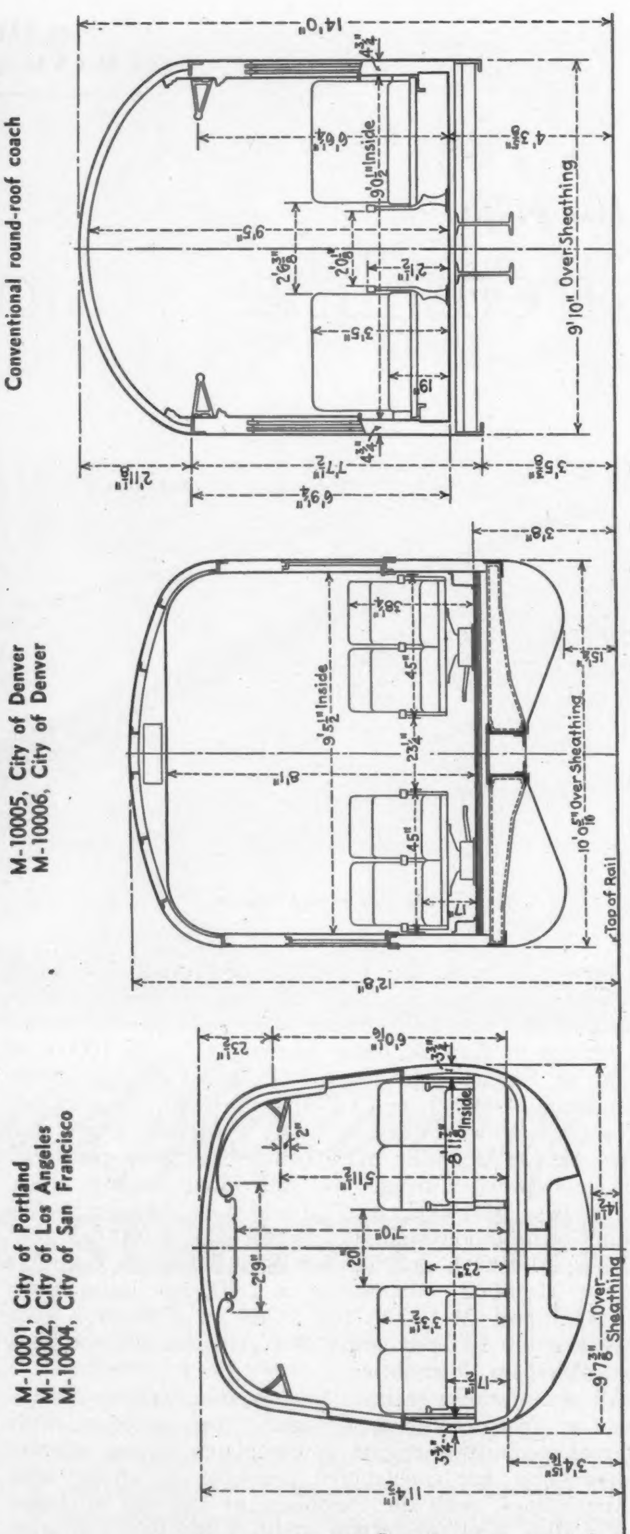
One of the 1,200-hp., 16-cylinder Diesel-engine power units

between the various trains will be apparent. The M-10000 consists simply of three articulated bodies with a single head-end power plant, provision to carry a limited amount of baggage, mail and passenger load and having a streamline metal end, housing a buffet. The M-10001 is somewhat larger in cross-section, has twice the power and includes four additional body units, three sleepers and a kitchen-diner-lounge. The M-10003 and M-10004 are further increased to 9 revenue body units to provide additional capacity in all services and a two-unit Diesel-electric locomotive. Each of these trains is fully articulated, with the exception of provision to uncouple the locomotive from the rest of the train. The M-10005 and M-10006 are increased to 10 revenue body units each, partially articulated in units of two, as shown, and have straight sides in conjunction with built-up underframes. In the locomotive of each of these trains, the cab is located about 10 ft. back from the nose of the leading unit, and, for the first time, the streamline buffet end is replaced by a more moderate streamline effect which permits providing a glass-enclosed observation end.

Body Design and Construction

The locomotive bodies of the M-10004, 5 and 6 are made of Cor-Ten steel with straight vertical sides and the cab set back. The circular engine-room sashes are set in chromium-plated frames. The front air intake grilles also are chromium plated. The thickness of Cor-Ten steel sheathing is as follows: 13 gage for the removable portion of the roof, for the sides, and for the curved bottom sheets adjacent to the sides of the car; 16 gage for the center bottom sheets below the power-plant well; and 11 gage for the curved sheets of the roof adjacent to the sides of the car.

The side posts are 3-in. Z-sections, weighing 5.1 lb.



Cross sections of Union Pacific streamline trains compared with that of a conventional round-roof coach

Union Pacific Diesel-Electric Streamline Trains Built by Pullman-Standard

Train number	M-10000	M-10001	M-10002*	M-10004	M-10005	M-10006
Train name	City of Salina	City of Portland	City of Los Angeles	City of San Francisco	City of Denver	City of Denver
Date placed in service	April 19, 1934	June 6, 1935	May 15, 1936	June 14, 1936	June 18, 1936	June 18, 1936
Structural material	Aluminum alloys	Aluminum alloys	Aluminum alloys	Aluminum alloys†	Aluminum alloys†	Aluminum alloys†
Type of construction	All-articulated	All-articulated	All-articulated‡	All-articulated‡	Partially articulated§	Partially articulated§
Number of cars (incl. power cars)	3	7	11	11	12	12
Total number of trucks	4	8	12	14	21	21
Normal seating capacity¶	116	118	170	170	182	182
Total number of individual seats	116	157	226	226	272	272
Overall train length	204 ft.	455 ft.	714 ft.	725 ft.	864 ft.	864 ft.
Total rated power	600 hp.	1200 hp.	2100 hp.	2400 hp.	2400 hp.	2400 hp.
Total light weight	190,070 lb.	568,880 lb.	950,318 lb.	1,005,600 lb.	1,250,450 lb.	1,250,450 lb.
Weight ready to run	200,140 lb.	597,280 lb.	1,005,588 lb.	1,064,300 lb.	1,333,900 lb.	1,333,900 lb.
E.-M., G. E. power plant	Distillate-electric	Diesel-electric	Diesel-electric	Diesel-electric	Diesel-electric	Diesel-electric
Type of roller bearings	S K F	S K F	S K F	Timken	S K F	Timken
Air brake equipment	New York	New York	New York	Westinghouse	New York	Westinghouse
Train consist:						
Unit 1	600-hp. power car‖	1200-hp. locomotive	1200-hp. loco. unit	1200-hp. loco. unit	{ 1200-hp. loco. unit	{ 1200-hp. loco. unit
Unit 2	Coach	Baggage-mail	900-hp. loco. unit	1200-hp. loco. unit	{ 1200-hp. loco. unit	{ 1200-hp. loco. unit
Unit 3	Coach-buffet	Diner-lounge	Baggage-mail	Baggage-mail	Mail car	Mail car
Unit 4	....	Sleeper	Kit.-bagg.-dorm.	Kit.-bagg.-dorm.	Baggage car	Baggage car
Unit 5	....	Sleeper	Diner-lounge	Diner-lounge	Bagg.-tap room	Bagg.-tap room
Unit 6	....	Sleeper	Sleeper	Sleeper	{ Coach	{ Coach
Unit 7	....	Coach-buffet	Sleeper	Sleeper	{ Coach	{ Coach
Unit 8	....	....	Sleeper	Sleeper	Diner	Diner
Unit 9	....	....	Sleeper	Sleeper	{ Sleeper	{ Sleeper
Unit 10	....	....	Coach	Coach	{ Sleeper	{ Sleeper
Unit 11	....	....	Coach-buffet	Coach-buffet	{ Sleeper	{ Sleeper
Unit 12	....	....	....	....	{ Pullman-observ.	{ Pullman-observation

* The number M-10003 is given to a reserve 2400-hp. articulated two-unit locomotive.
† Except for the 2400-hp. articulated two-unit locomotive made of Cor-Ten steel.
‡ Except for provision for separating the locomotive from the rest of the train.
§ Articulated in units of two, as shown by braces in lower part of the column.
¶ Exclusive of non-revenue seats in diner, lounge, cocktail room, observation end, etc.
‖ This car also includes space for baggage and mail.

per ft. The center sills at the power-plant well are Z-sections 26 in. deep, having ¼-in. webs and ⅜-in. flanges 3¼ in. wide. They are formed of plates and angles electrically welded together. Side sills are provided in these structures by the use of 3½-in. by 3½-in. by 5⁄16-in. angles.

The trailing body units are built of strong aluminum-alloys throughout, with the exception of such parts as body bolsters and end sills, which are of high-tensile alloy steel. The structures are of tubular form with side and roof sheets .156 in. thick.

Each body has a box-type center sill comprising two 10-in., 8.84-lb. aluminum channels with ⅜-in. thick by 20-in. wide top and bottom cover plates, so designed as to resist a buffing load in excess of 400,000 lb. Center sills are connected to the side sills and sheets with ⅛-in. thick pressed-pan needle beams spaced approximately 6 ft. apart longitudinally of the car, with floor stringer supports spaced between the needle beams.

The side sill is a special extruded aluminum section, continuous in length throughout the car. The side posts are extruded flanged channel sections extending continuously from the lower edge of the needle beam to the top center of the roof, forming continuous side posts and roof carlines.

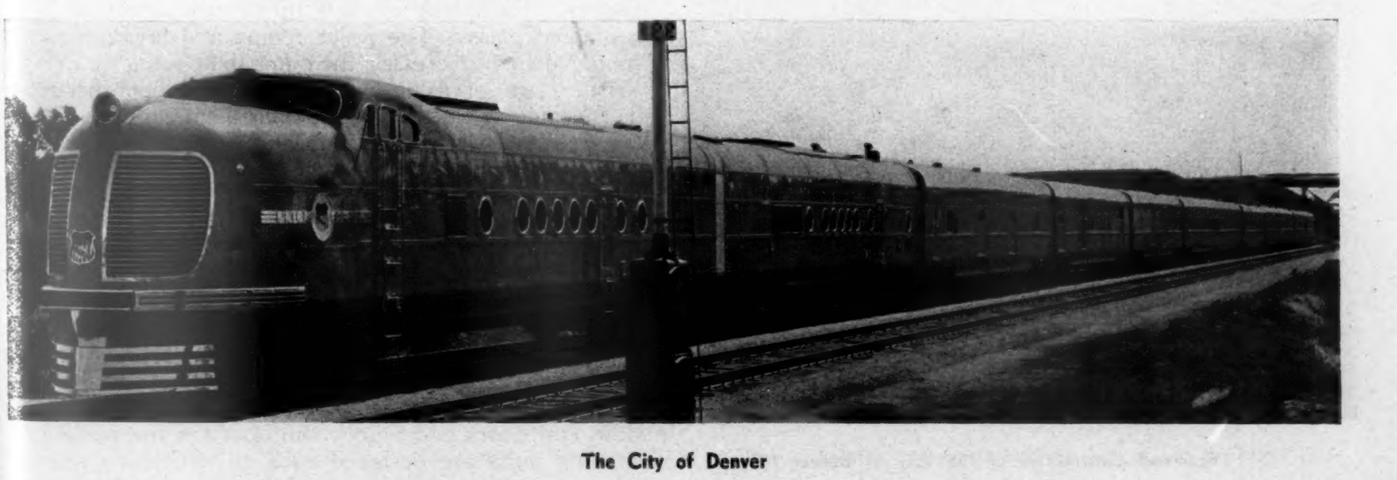
Immediately below the roof are longitudinal members, extending the full length of the car and comprising extruded aluminum sections with numerous flanges for attachment thereto of frame members, ceiling, etc. These channels, in combination with the roof and a bottom sheet, form the duct for air conditioning. The fastening of the side, bottom and roof sheets to the framing members is by 5⁄16-in. Huck rivets, except at points where rivets of a larger size are required.

Important cast-steel structural parts are of special heat-treated alloy cast steel. Conventional anti-telescoping features are built into the ends of the cars, consisting in this case of heavy aluminum plates extending across the car at the floor line back of the end sills and above the end doors of the cars.

While both of the new trains embody primarily riveted construction, on the M-10004 train, for example, including the Cor-Ten steel locomotive bodies, there is a total of 7,690 lin. ft. of arc welding, 822 lb. of welding rod being used.

Articulated Connections between Body Units

The two locomotive body units of each train are articulated through a steel bridge casting which spans the rear truck of the front unit and the forward truck of the rear unit. The locomotive couples to the train by means of National Traxo Tight-Lock couplers, designed with Type E heads and incorporating Spencer-Moulton rubber draft gears. Specially designed canvas diaphragms are used to close the space between these cars. The steam and air lines are carried across between all non-articulated car connections by means of armored hose with standard couplers. The steam line is 2 in. and



The City of Denver

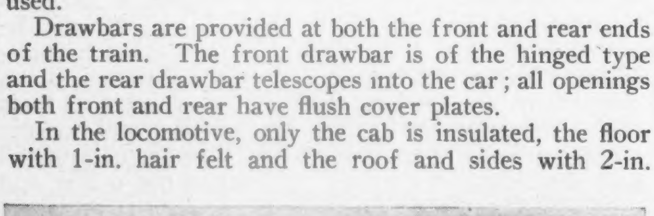
Interior of one of the Cor-Ten steel locomotive units in the course of construction

the air line 1⅛ in. Electric connections are made by means of Pyle National receptacles and ordinary jumpers.

The articulated trailing bodies have lubricated semi-spherical center plates extending from the end sills of adjoining cars and nesting in a common center plate cast integral on the truck bolster. A lock-type center pin is applied through each center plate nest as a safety measure. The gaps between the articulated bodies are entirely closed at the sides and roofs by means of diaphragms of extra-stretch pigmented rubber, spanning from one car to the next. The passageways between the cars are also enclosed, and dust-tight rubber inner diaphragms are used.

Drawbars are provided at both the front and rear ends of the train. The front drawbar is of the hinged type and the rear drawbar telescopes into the car; all openings both front and rear have flush cover plates.

In the locomotive, only the cab is insulated, the floor with 1-in. hair felt and the roof and sides with 2-in.



Rear-end construction of the City of Denver

light-weight Salamander. The trailing body units are insulated with 2-in. light-weight Salamander, covered with Sisalkraft paper on both sides. Insulation is supported from the back of the roof sheets and fastened to the inside of exterior side and end sheets with cement and metal bands. A further insulation is provided by heavy felt insulating paper, cemented to the back of all head-lining sheets and interior finish sheets in the passenger-carrying bodies.

The bottoms of bodies, which are completely closed, with removable doors giving access to equipment, are likewise insulated, the insulation, however, being entirely sealed with Sisalkraft paper to protect it against any condensation that may accumulate within the enclosed area. At the ends of the structures and over the truck pockets where the space is restricted, layers of cork insulation are used.

The main sash in the passenger and sleeping compartments of the M-10004 have Pittsburgh hermetically sealed dehydrated Unit-type glass in extruded aluminum frames. Each unit is made up of two lights of ¼-in. laminated glass. The toilet rooms and lavatories have similar dehydrated glass, the outer light being of Pressed Prism ¼-in. translucent design. The upper berths in the sleeping sections and in compartments in the bedroom car are fitted with dehydrated Unit-type sash, there being two sashes 12 in. wide in each berth fitted with Formica sliding panels to exclude outside light when not desired. The locomotive has single glazed ¼-in. safety glass in hinged aluminum sash frames.

All exterior side doors and end doors and interior doors are of aluminum construction. Passenger side entrance doors are of hinged type, swinging inward. Baggage- and mail-compartment side doors slide on curved upper guide and lower track designed to bring the doors flush with the sides of the train when closed. Main end doors and toilet-room doors in the passenger-carrying units are designed with an anti-pinch feature.

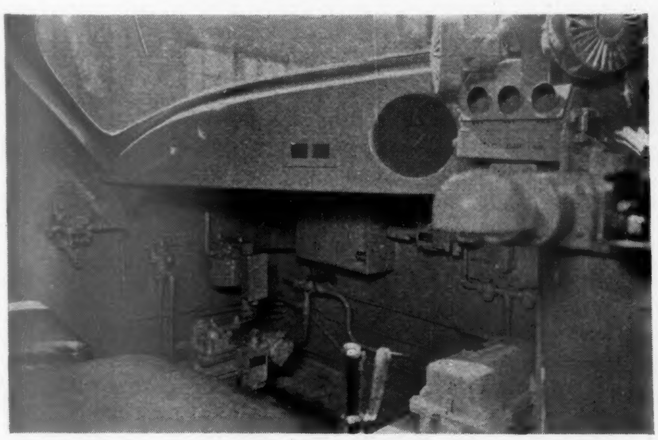
Forged steps, of designs to suit streamline train conditions, are provided for the cab and engine compartment, mail room and baggage compartment and loading side doors. Passenger entrance steps are of the pivoted type, operated with a sprocket and chain mechanism, so designed that the lower riser and tread form a part of the platform and door threshold, and the back of the step lines up with the contour of the car shell and entirely closes the step opening when in raised position. No trap doors are used.

Union Pacific Train Scale Weights on Rail, Light, in Lb.

	M-10002	M-10004	M-10005, 6
Truck No. 1 (first locomotive unit)...	96,040	108,193	106,933
2 (first locomotive unit)...	75,415*	87,572*	87,442*
3 (second locomotive unit).	75,575*	87,572*	87,442*
4 (second locomotive unit).	87,410	108,053	108,173
5	54,918	55,410	63,170
6	53,740†	55,060†	41,665
7	63,840†	62,560†	42,410
8	63,580†	63,640†	44,040
9	69,720†	69,580†	44,855
10	66,440†	66,140†	50,440
11	70,680†	70,060†	46,970
12	66,680†	66,300†	46,820†
13	61,820†	61,380†	46,060
14	44,460	44,080	49,695
15	.....	.....	50,155
16	.....	.....	50,515
17	.....	.....	66,970†
18	.....	.....	50,875
19	.....	.....	51,475
20	.....	.....	68,650†
21	.....	.....	45,695
Total wt., car bodies only...........	617,572	679,370	819,480
Total wt., on rails, light............	950,318	1,005,600	1,250,450
Total wt., ready to run (with liquids).	1,005,588	1,064,300	1,333,905
Total wt., on rails, loaded...........	1,069,788	1,128,500	1,482,860

* Special bridge-connected trucks under articulated locomotive units.
† Trucks under ordinary articulated body connections.

The exterior of the train is in two colors, leaf brown on the roofs down to the top of the letterboard and on the rounded bottom up to a line even with the bottom of the side door openings. A canary shade of yellow is used on the sides, separated from the brown with bands of scarlet, the top band being 1½ in. wide and the bottom band 2½ in. wide. The lettering is in gold leaf edged with black.



A.T.C. cab indicator and air brake equipment, including the Decelerometer, in the cab

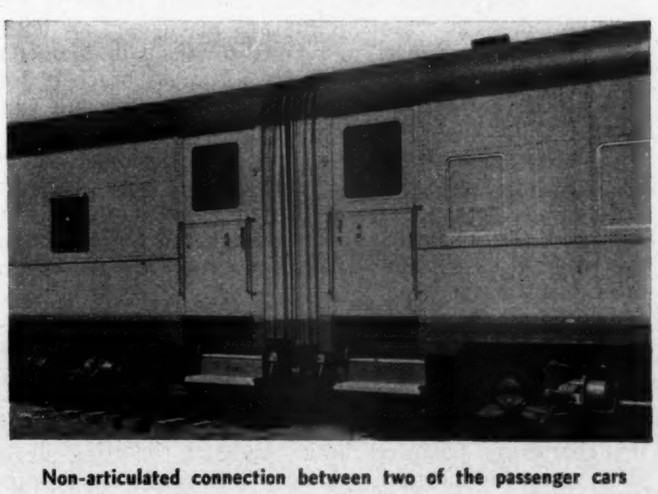
Heating and Air Conditioning

Each train is heated by dual Vapor high-pressure oil-fired boilers, burning the same fuel oil as that used in the main Diesel engines. Fin tubing and piping of copper is used in connection with a reduced steam pressure. The steam train line and other piping under live-steam pressure is of steel pipe. Flexible armored steam-line connections between the body units are looped upward so as to be self-draining. Standard Vapor metallic connectors carry the steam line across the space between the locomotive and the train. There are Pyle-National receptacles and jumpers for the electric lines and standard air-brake couplings and hose for the air lines.

Construction of the aluminum-alloy underframe and tubular superstructure frame

Each of the passenger-carrying units has air-conditioning equipment which comprises dual units for both (preheated air) heating and cooling, located in compartments, one on each side of one end of each unit. Each compartment contains in the lower section a complete condensing unit comprising a Frigidaire compressor and 220-volt, 3-phase, a. c. motor, driving the compressor, with a condenser fan mounted on the opposite end of the motor shaft and a condenser, a receiver tank and necessary piping. Air for condenser cooling is drawn in through the floor and blown out through the side of the car.

The upper section of the compartment comprises the cooling and heating equipment, including blower fans, filters, heating coil, cooling coil and the necessary piping, fittings, valves, etc. Air circulation is through a center overhead duct; in the sleeping cars there are branch ducts from the main duct to the berths. Fresh air in all cases is drawn in through the side of the car. The two units on each side of the car are connected in parallel.



Non-articulated connection between two of the passenger cars

Floor heat coils under thermostatic control are used as the balancing element in maintaining car temperatures. Thermostatic control is used for both cooling and heating. Essentially, this control is the same as used on standard air-conditioned cars. For ventilation purposes there are bottom rail sash ventilators in the dormitory car to supplement the roof exhaust fans. Exhaust fans are also provided in the dining and lounge sections, bedrooms, kitchen, buffet, mail room and crew's dormitory.

The brake equipment is of the Decelakron electro-pneumatic control, light-weight H S C type, with brake cylinders truck mounted. Aluminum tubing and flared fittings are used throughout except on the trucks and piping extending outside of the bottoms of cars, which is of heavy steel pipe. A lever-handle type of hand brake is provided in each of the locomotive units, at the forward end of the first trailing unit and in the rear unit.

Gravity tanks supply water for the toilet facilities in the second locomotive unit and in the mail compartment. For the balance of the train, a separate air-pressure water system is provided on each unit. Aluminum tubing and fittings for water supply are used throughout. The hot water supply is provided by means of jackets in the steam train line. The kitchen and buffet hot water is supplied through the ranges.

The interior finish and headlinings, throughout, are of aluminum-alloy sheet construction, with moldings and extruded sections also of aluminum alloy.

Power and Trailer Trucks

Each of the four four-wheel equalizer-type power trucks (per train) has an 8-ft. 4-in. wheelbase, 36-in. diameter rolled-steel wheels, and roller bearings mounted on special forging quality carbon-steel axles. Lebanon cast channel-shape side-frames are provided, with transom and end frames cast separately and bolted to the side-frames. All frame joints are machined; all holes are jig drilled and machine reamed to take 1-in. diameter turned bolts with Grip lock nuts. Hanger brackets for brake heads are cast as part of the transom and side frame.

The spring suspension includes a double combination of long-travel coil equalizer springs and elliptic bolster springs. The truck frame is supported on equalizer springs seated on drop equalizer bars. All truck springs are made of either silico-manganese or chrome-vanadium steel, heat-treated.

Unit braking is used, with four cylinders per truck. The clasp brakes are designed for four 12½-in. shoes per wheel. The screw-type slack adjuster is manually operated. All brake members are spring joined to eliminate rattle. Brake heads are suspended with patented non-chattering balanced brake hangers, insuring even shoe wear and positive release. The entire brake rigging is designed to eliminate yield, making it very sensitive to application and release pressures.

Spherical-type truck center plates are cast as part of the truck bolster and sealed to form an oil reservoir for lubricating. All wear plates are of manganese steel with ground finish. Manganese-steel bearing surfaces are supported by rubber and wood blocks encased in the cast-steel side-bearing supports.

The trailer trucks are the new Union Pacific-Pullman Standard four-wheel type with 8-ft. wheel base and 34-in. diameter, cylindrical-tread rolled-steel wheels. The frames are heat-treated alloy-steel castings. The side frames are U-shape, box-cast trusses and the transoms cast box sections. The side frames and transoms are of the non-integral type, connected by bolting at the top and bottom. As in the case of the power trucks, all joints are machined and bolt holes jig drilled and machine-reamed for 1-in. diameter turned bolts with lock nuts. Hanger brackets for brake heads are cast integral as part of the transoms and side frames.

The spring system is a triple combination of long-travel, alloy-steel journal-box springs, short-travel intermediate bolster springs, and elliptical main bolster springs. The intermediate bolster springs are inserted between the transoms and the top spring-plank hanger fulcrums. The truck frame is mounted on helical springs, seated low at each side of the journal-box housing to provide long travel for these springs, and maintaining clearance for a low car floor. The ingenious combination of springs and suspension in this truck is designed to eliminate the harmonics and uncomfortable riding sometimes experienced in trucks of conventional design.

The trailer trucks also have four brake cylinders per truck, truck mounted. Clasp brakes are used, with four 9-in. shoes per wheel. All brake members are designed to eliminate rattle and wear and brake heads are suspended by the friction-balanced brake-hanger arrangement mentioned to assure alignment and even shoe wear. No offset rods or levers are used, the entire brake rigging being specifically designed to deliver braking force directly to the brake shoes without yield or slippage, making the brake sensitive to application and release.

Side bearings at the articulated connections are manganese steel wear blocks, mounted on helical springs which are, in turn, supported by a differentially balanced rocker arm. Side bearings at non-articulating trucks are of the roller type.

Union Pacific-Pullman-Standard trailer truck

Principal Features of the Power Plants

The power plants are of the Diesel-electric type, with a combined rating of 2,400 hp. Each main engine is a V-type 16-cylinder, high-compression, two-cycle oil engine of 8-in. bore and 10-in. stroke, developing a rated output of 1,200 hp. at 750 r.p.m. This is direct-connected

through a flexible coupling to a General Electric d.c. generator which furnishes electric power for the 300-hp. nose-suspended traction motors. Electric control equipment is of the P C L type. Each locomotive has a total of eight traction motors, two on each of the four motor trucks.

The main engines are cooled by means of radiators mounted in the roofs, the heat from the engines being dissipated to air which is taken in at the front end of each unit, passed through a partition forward of the engine in which are mounted four engine-driven fans, and discharged through the radiators to openings in the sides of the depressed trough in the roof. Cooling water for one of the auxiliary engines is piped into the main cooling system, and the other has its own cooling system of a character similar to that of the main engines.

A 32-cell MVAH 25-plate Exide Ironclad battery is furnished in each locomotive unit to supply power for engine starting, transmission control, cab and engine-room lights and emergency train lights. It has a capacity of 450 amp. hr. at the 10-hr. discharge rate.

All auxiliary electric power for the train is furnished by two 75-kv.a., 220-volt, 3-phase, 60-cycle Diesel-driven alternators with direct-driven 7.5 kw., 78-volt, d.c. exciters. The exciters are paralleled through proper reverse-current relay controls with MVAH-25 lead-type battery sets.

One auxiliary plant, located at the rear of the front locomotive unit, flanked by the battery compartments for this unit, supplies 220-volt, a.c., 3-phase current to all of the air-conditioning compressor motors which also drive the condenser fans. The exciter battery circuit furnishes d.c. for traction-motor controls, electro-pneumatic brake valves, sander valves and the train telephone system, with loud speaker and amplifier (220-volt, a.c. supply) in the cab. D.c. power is also used for the headlights, the marker lights, the engine-room lighting, windshield wipers, and anti-frost fans at the cab windows. This d.c. circuit is carried through the entire train, and also supplies operating current to all air-conditioning thermostat and valve controls.

The second auxiliary plant is located in a special compartment at the forward end of the mail and baggage unit and is flanked by a battery set at that point. This set, other than being used locally for starting up the Diesel engine and for local auxiliary room lighting, is kept in reserve but may be cut into the battery-circuit d.c. train line for the air-conditioning controls, etc., as required.

The 220-volt, a.c., 3-phase power is used primarily for lighting of the entire train, but is used also for operating the blower fans in each body unit for air conditioning, forced-air circulation, and in the case of the diner, to better proportion the electrical loading on the two plants. It also supplies power to the compressor motors at that point only. This second plant train line also supplies power to the kitchen refrigerators in the diner and in the buffet (rear), to the various appliances, such as drink mixers, toasters, etc., to exhaust fans, and to the radio receivers in the diner and buffet cars. Mail-car lighting is available on a.c. or d.c. through proper relay control, using the auxiliary plant battery as the emergency supply.

To prevent all compressor motors coming in at the same time on initiating service, a timing control line, fed from a master under-voltage relay in the baggage car, supplies a series of timing relays set at different time adjustments which permit the completion of control circuits between cooling thermostat relays and compressor motor starters only in the proper time sequence. Should an overload take place at any time, the under-voltage relay drops out for an instant, stopping all the motors, and then reconnects the timing circuit, which requires each motor to come in again at the proper time.

The intermediate power trucks are connected by a bridge casting which supports the locomotive articulated joint

A cross-tie switch permits inter-connection of both electric train lines so they may be fed in common from either generating plant. For stand-by terminal service, 3-phase, 220-volt receptacles are provided at each car to allow using station power during layovers.

Train Control and Cab Signals

The locomotives of the City of Denver streamliners are equipped with a composite cab-signal and speed-control system. This equipment, furnished by the Union Switch and Signal Company, is designed for operation on the Chicago & North Western between Chicago and Omaha, Neb., as a two-indication cab-signal system with two-speed control. On the Union Pacific, between North Platte, Neb., and Julesburg, Colo., the equipment functions as a two-indication cab-signal system with a warning whistle and acknowledging feature. The cab-signal apparatus is similar to that in service on steam locomotives on the Union Pacific lines. However, as with the City of Portland, a new-type, compact, electric, speed governor is used in place of the older type governor used on steam locomotives.

The pneumatic equipment is of special design to provide the required train-control operating features in conjunction with the electro-pneumatic air-brake system designed for these high-speed trains. The air-brake equipment is so designed that the brakes can be operated either by straight air or by automatic air. Consequently,

the train-control apparatus is designed to function under both the straight-air and the automatic-air systems. The train will be operated normally on straight air, but if a train-control application should be initiated at such time when the straight-air lines are not intact, a full service automatic-air application will be obtained without any action on the part of the engineman.

The equipment is arranged so that the engineman may at all times retain control of the train braking, provided proper action is taken to observe the prescribed speed limits. If the engineman takes no action, the train-control brake application is initiated eight seconds after the speed limit is exceeded, or after the signal changes to the more restrictive indication if the speed is above the low speed limit. However, the engineman may suppress this brake application by initiating a manual brake application prior to the expiration of the delay time and maintaining it until the speed is reduced to the prescribed speed limit.

The train-control apparatus is cut out while the train is in operation over the Union Pacific cab-signal territory as well as in ordinary automatic block signal territory.

Headlights, Marker Lights, Signals, Etc.

The Pyle-National horizontal and vertical beam headlights are in a housing on the roof over the operator's cab. A General Electric electric speed indicator is driven from the end of one of the front power-truck axles, with a dial in the cab to show train speeds, which are governed by Union Switch & Signal automatic train-control equipment with cab signals. Marker lights on each side of the car close to the rear end of the train are practically flush with the contour of the exterior. These lights are wired to the battery circuit. Classification lights are provided at the front end of the operator's cab on each side of the locomotive, fitted with white and green lens.

An electro-pneumatic inter-train signal transmission system is employed, with pushbuttons conveniently located adjacent to each side door. In addition, an important innovation is the Automatic Electric intercommunicating telephone system installed for the exclusive use of the train crew. The Magnetic Monophone principle is employed. There are four telephone stations, including one in the locomotive cab, one in the second locomotive unit, one in the front baggage section, and one in the buffet-coach.

Warning devices consist of a dual pneuphonic horn and a 50-lb. Hammett bell with bell ringer. A pneuphonic warning horn is also located at the rear end of the train for use during back-up operations. A specially designed rubber bumper is applied at the front end of the locomotive.

City of Denver Trains Best Equipped and Fastest

The Union Pacific twin streamlined City of Denver trains are not only the longest and largest but best equipped trains yet placed in long distance service. These trains also operate on the fastest long-distance schedule in regular service in this country, making the 1,048 miles between Chicago and Denver, Colo., in a total elapsed time of 16 hours, including eight station stops, or at an average speed of 65.5 m.p.h.

In addition to three Pullman sleeper units, a Pullman bedroom-observation unit and a diner, this train also carries two coaches. Complete air-cooling and conditioning equipment is installed to furnish an adequate supply of clean, tempered air in all passenger compartments. The train is provided throughout with special lighting fixtures which produce pleasing effects and furnish adequate light for general illumination, reading, night lights, etc., dependent upon the requirements.

Still another unique feature is the equipment of one of the baggage cars just ahead of the coaches with a replica of a frontier tavern, called the "Frontier Shack," which is authentic in every detail. In it is installed a radio. A second radio has a loud speaker in each coach and there is a third radio in the observation room. Radio reception is also available in the dining car.

The dining car is not only fully equipped with a modern kitchen, dining section and cocktail room, but, like other passenger cars in the train, employs a generous use of Flexwood natural wood veneer and treated aluminum trim to secure beautiful and artistic interior effects.

The cocktail-lounge section is separated from the dining room by a low partition, topped with an etched edge-lighted thick plate glass. The partitions between the cocktail-lounge section and the lobby have ornamental welded design aluminum grilles.

Special Features of the Pullman Cars

The two bedrooms in the second sleeper unit and four of the five bedrooms in the rear body unit are built en-suite; that is, arranged with sliding partitions between each pair of rooms which can be thrown back to form a large room. Each bedroom has a sofa with folding arm-rest, the sofa back being specially designed so that, when raised, it serves as an upper berth. All cushions and mattresses are of rubber construction.

The first and third sleeper units have open sections and the second has sections enclosed with louvered panels. Both open and enclosed-section units are decorated in three shades of tan enamel. The compartment walls in the enclosed-section sleeper unit are decorated in three shades of blue, with a tan twist-weave carpet. The seat covering is in henna and the window shades are of rose color. The bedrooms are finished in three shades of tan, with tan twist-weave carpet, sea green mohair seat covering and ecru window shades with a tan horizontal stripe design. The general color scheme in the washrooms is three shades of blue. The window-shade material is of the rose color used in the main room.

The bedrooms and compartments in the rear unit have the same color schemes as given above and the observation room is finished in two shades of tan with an ivory ceiling.

Novel Lighting Fixtures

The lighting fixtures, throughout the train provide artistic lighting effects. General illumination is given by both direct and indirect light. A distributed light intensity of 10 foot-candles is available, without glare, at the reading plane. Subdued blue light is provided for night use.

In the Pullman units, an adjustable lower-berth reading light is used for the first time, which permits the occupant to direct the light where it is most needed to meet the requirements of his particular position. A blue night light, within the fixture, is controlled by a double-throw toggle switch with a luminous tip. On the ceiling, a continuous combination direct-lighting fixture and air-conditioning distribution duct is used, running from one end of the car to the other. This also has blue night lights within it which are controlled by separate switches.

In the Pullman bedroom-observation unit, a semi-indirect louvered trough light is used, which is applied above the windows and continues completely around the interior. It is constructed so that 70 per cent of the illumination is thrown onto the reading plane, 20 per cent is reflected to the ceiling, and, for decoration, 10 per cent is directed through a blue-colored screen and reflected onto the face of the trough. This trough is curved around the end of the car.

Busch-Sulzer

2,000-Hp. Switcher

Illinois Central Diesel-electric locomotive weighs 173 tons and is powered by a single Diesel-engine-generator set

THE Illinois Central has recently placed in heavy freight transfer switching service at Chicago the most powerful, single-unit, Diesel-electric locomotive so far constructed in this country. This locomotive, built for the Busch-Sulzer Bros. Diesel Engine Company, St. Louis, Mo., by the General Electric Company at Erie, Pa., is designed to combine a high degree of simplicity, rugged construction and ease of maintenance, with ample capacity, both mechanical and electrical, to assure reliable performance in the service assigned. It develops 2,000 hp. and weighs 173 tons.

Principal Features of the Diesel Driving Engine

The heart of the locomotive is the new Busch-Sulzer, 2-cycle, 10-cylinder, V-type Diesel engine which is conservatively rated at 2,000 brake horsepower at 550 r.p.m. in continuous service. The principal dimensions of the engine are shown in the table.

As the service for which the locomotive is intended demands a high starting tractive effort, it was found that an engine weight of 36 lb. per brake hp. could be employed to advantage. The same engine can be built with a weight of 23 lb. per hp. where service conditions necessitate lower weight.

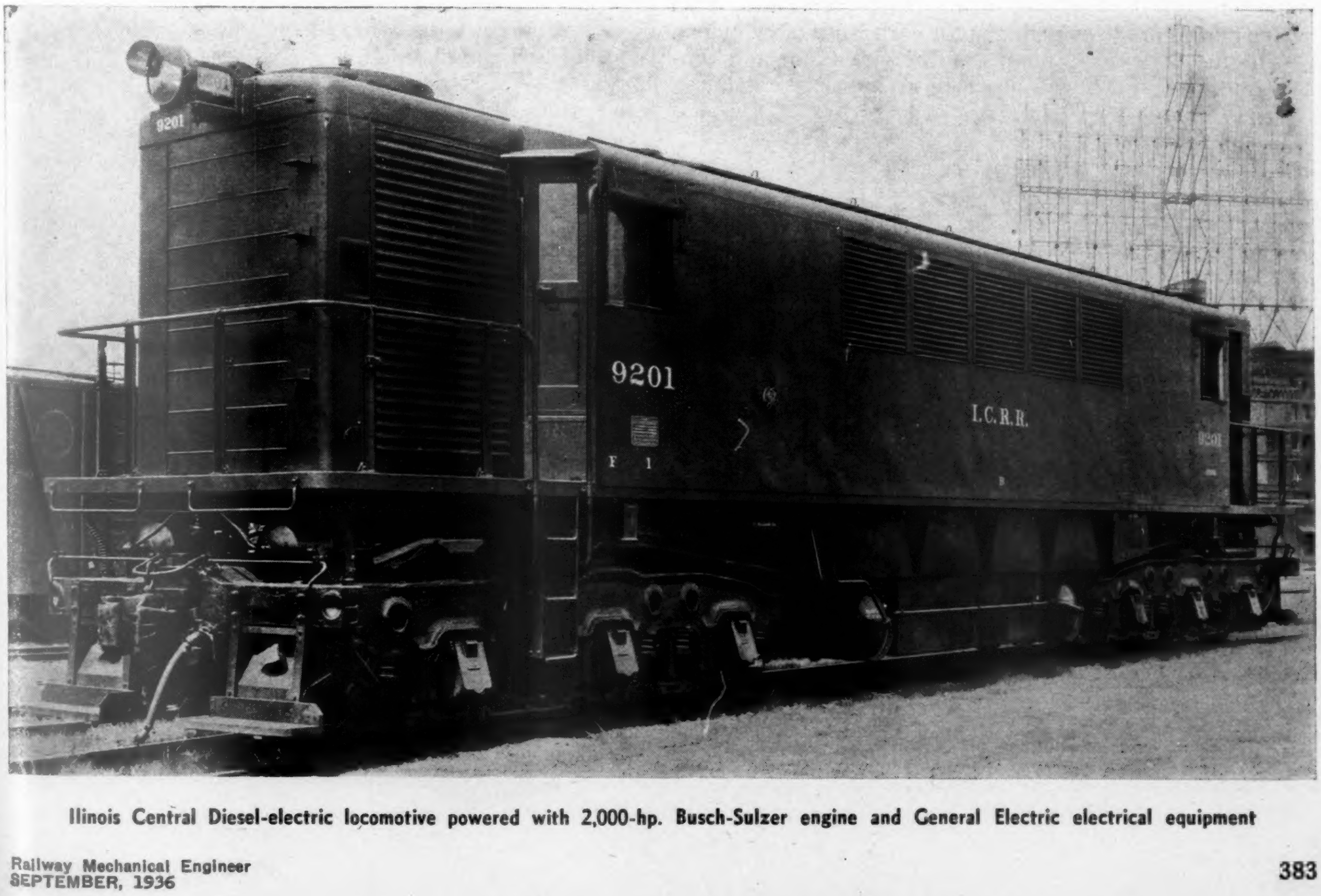
The engine is of the single-acting, mechanical injection, trunk-piston type, having 10 working cylinders arranged in two banks of 5 cylinders each, operating on the Diesel cycle. The angle of the vee between the cylinder banks is 45 deg.

Scavenging air is supplied by gear-driven, Roots-type, rotary, positive-displacement blowers which are mounted across the top of the vee between the two banks of cylinders. The blower housings act as covers and the vee is thus utilized as the receiver for the scavenging air.

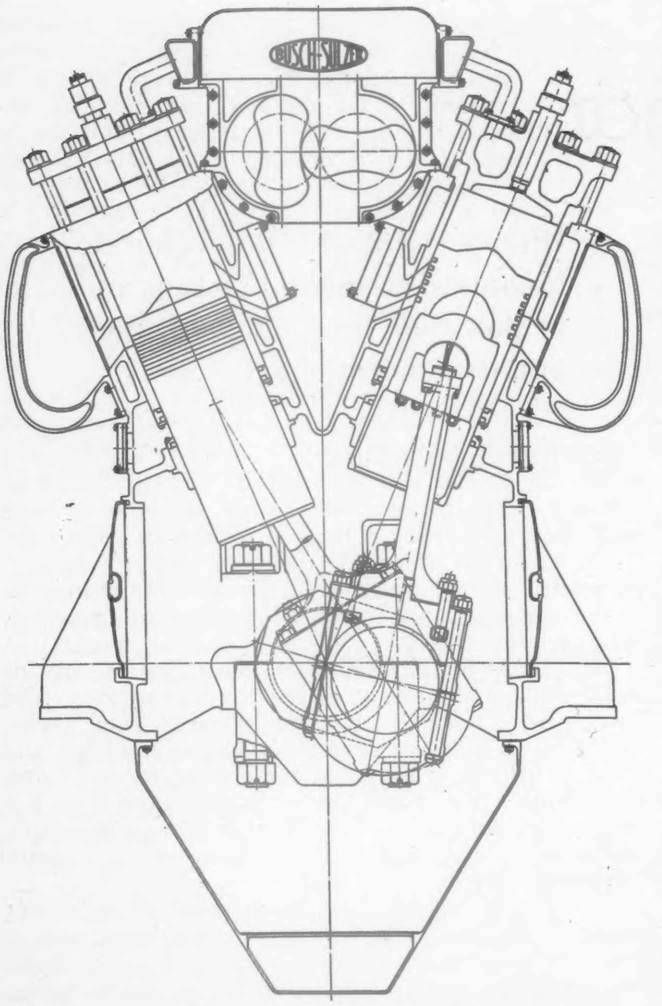
The engine is started by applying power from the locomotive storage batteries to the generator attached to the engine crankshaft. During the starting period, the generator, therefore, acts as a starting motor.

The pumps for circulation of lubricating oil are integral with, and directly driven by, the engine. The lower pump, referred to as the scavenging oil pump, draws the oil from the sump in the engine crankcase and forces it through a filter and the cooling radiators into surge tanks. The upper pump draws the oil from the surge tanks and forces it into the main lubricating supply header which distributes it to all points of the pressure lubricating system.

The fuel oil booster pump is mounted on a bracket integral with the lubricating oil pump housing, and is driven by an extension of the lubricating oil pump shaft. The centrifugal pumps for circulation of jacket cooling water are mounted on the engine, and are driven by



Ilinois Central Diesel-electric locomotive powered with 2,000-hp. Busch-Sulzer engine and General Electric electrical equipment



Cross-section of the 2-cycle, V-type Diesel engine

extensions of the fuel measuring pump camshaft. Two water pumps are provided, one for each bank of cylinders.

The fuel measuring pumps and the governor and control mechanism are mounted in a housing extending across the end of the engine farthest from the generator. The pumps are driven by gears and a vertical shaft from the end of the engine crankshaft.

Pistons are made of cast aluminum. The wrist-pin bearing is provided in a separate housing which is inserted into the piston from below. The piston skirt is, therefore, not pierced by the wrist-pin, resulting in a construction that permits full freedom for expansion.

The design of the working cylinders incorporates the use of an upper and a lower cylinder liner, the upper liner containing the scavenging and exhaust ports. The lower cylinder liner is inserted into the engine frame from the inside the crankcase. Both of these liners extend into a so-called "sludge chamber," there being a gap between the ends of the liners which permits unobstructed inspection of the piston while the engine is running. The sludge chambers are equipped with glass inspection covers for this purpose and electric lights are provided to illuminate the sludge chambers.

The lower end of the upper cylinder liner is provided with a segmental type sealing ring and an oil wiper ring. The lower cylinder liner carries an oil wiper ring. All oil scraped from the piston skirt by the wiper rings is returned to the engine sump. That scraped off by the upper rings collects in the sludge chamber, from where it drains off continuously. That scraped off by the ring in the lower liner is piped back to the engine sump. All of this oil is recirculated through the main lubricating oil system.

The sludge chambers are continuously ventilated through ducts which connect to the scavenging blower suction. The ventilating ducts are provided with centrifugal oil separators which catch all lubricating oil that is held in suspension and return this oil to the crankcase sump.

The above described sludge chamber design provides the following features and advantages over the conventional engine construction. No hot combustion gases, or sparks, can enter or heat up the crankcase; lower crankcase and lubricating oil temperatures tend to lower the consumption of lubricating oil.

The action of the two sets of wiper rings, which are located above and below the sludge chamber effectively prevents excessive quantities of lubricating oil from being

The Busch-Sulzer 2,000 brake-hp. Diesel engine

carried from the crankcase into the cylinder by the piston skirt. This, of course, results in a large saving of lubricating oil which would otherwise be wiped into the cylinder ports and eventually lost when carried out into the exhaust headers. It is also possible to adjust the feed of the cylinder lubricators so that just the proper amount of lubricating oil is supplied to the pistons and rings, since the condition of the pistons can be determined by inspection through the sludge chamber inspection covers.

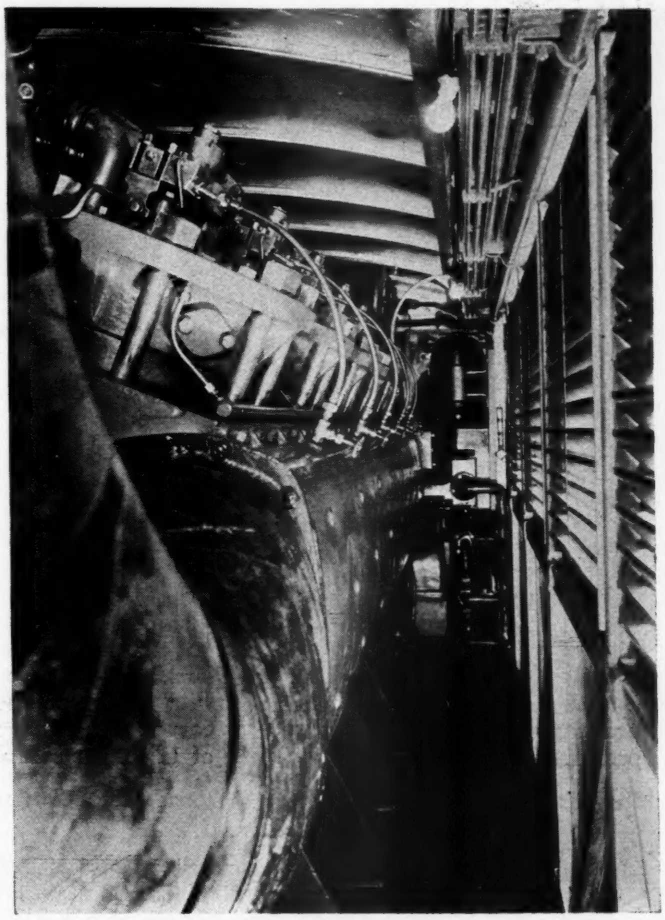
Cylinder liners are made of a special alloy cast iron. The upper liners are fastened only at their upper flanges, thus providing full freedom for expansion. The lower liners are fastened only at their lower flanges, thus providing also full freedom for expansion.

The engine frame is made of cast iron and includes the crankcase with cross girders and bearing saddles, as well as the cylinder jackets for both banks of cylinders. Special alloy-steel bolts and studs are used where required by stress conditions. The materials used in the construction of fuel pump parts, fuel valves, etc., are especially selected to minimize wear and breakage. The well-known "Hesselman" system of fuel injection is incorporated.

The design of the engine incorporates a so-called "underslung" crankshaft which is supported in bearing caps which register in, and are bolted directly to, the cross girders in the crankcase.

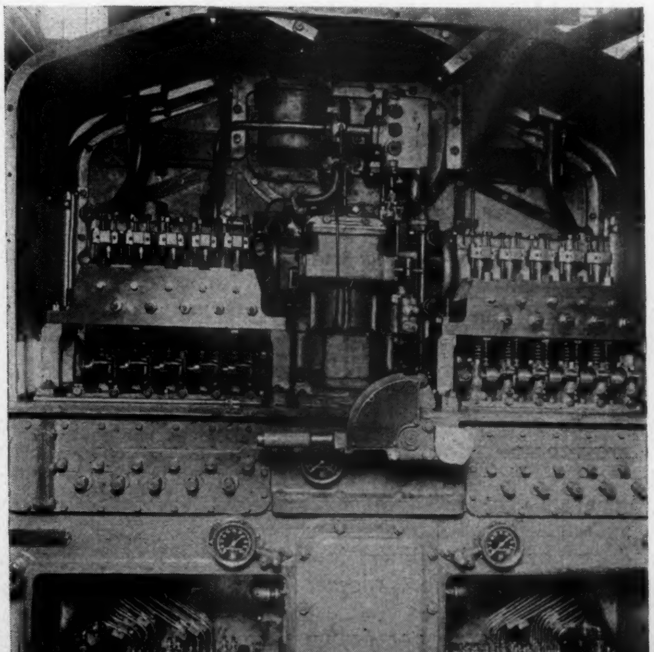
An oil pan, or trough, which is bolted under the engine frame, acts as a collector for all lubricating oil that drains from the various engine bearings. Since the scavenging oil pump continuously pumps out all oil that collects in the trough, the engine operates with what is commonly referred to as a dry sump. No large quantities of oil collect in the crankcase where it would be broken up into spray or vapor by the fanning action of the cranks.

All engine bearings, gears and control mechanism are pressure-lubricated. The engine control servomotor and the governor relay are also operated by pressure oil

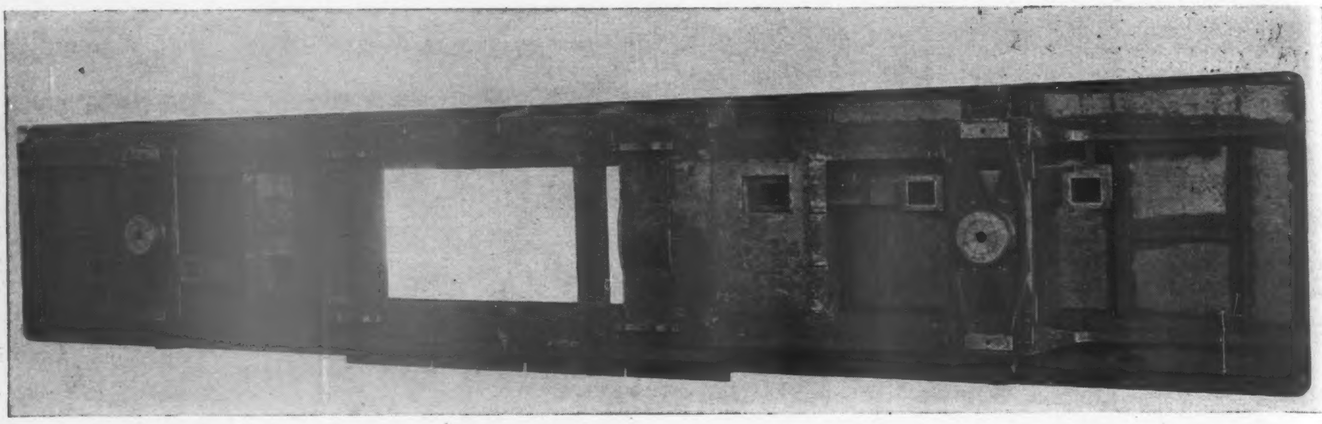


Engine room view, showing one bank of cylinders

Radiator compartment showing the arrangement of the vertical fan



Free end of the Diesel engine, installed in the locomotive, with the covers removed



Welded fabricated steel underframe for 2,000-hp. locomotive

from the main lubricating oil header. The engine controls are, therefore, arranged so that the engine cannot be started, or operated, on fuel unless a minimum pressure of 12 lb. per sq. in. is registered in the pressure lubricating system.

If the pressure in the system drops below 12 lb. per sq. in., due to a break in a main feed line, loss of oil in the system, or sticking open of a relief valve, the engine will immediately be shut down. The engine cannot be re-started on fuel unless the cause for the pressure drop is determined and corrected and the pressure brought up to the minimum of 12 lb. per sq. in.

Engine Speed Control — Starting and Shut-Down Devices

The speed of the engine is regulated by a variable-speed governor which is adjusted to control the operation of the engine within the range from 275 r.p.m., idling speed, to 550 r.p.m., maximum speed. The engine may be operated at any desired speed within these limits.

An overspeed safety governor is also provided. This unit functions entirely independent of the main variable-speed governor and is set to prevent the engine speed from increasing more than 10 per cent above its maximum speed of 550 r.p.m. If the engine speeds up to a point higher than approximately 605 r.p.m., it will, therefore, automatically be shut down and re-starting will not be possible until the overspeed cut-out mechanism has been re-set. This re-setting can only be done at the engine.

The control lever, located at the fuel pump end of the engine, is used when starting the engine and can also be used for stopping it. A pneumatically operated shut-down device is also provided which is operated from the control station in the operating compartment of the locomotive. The engine cannot be started from the engineer's cab; this can only be done by operating the main hand-control lever located at the forward end of the engine.

The crankcase and the sludge chambers of the engine are ventilated through ducts which are connected to the suction side of the scavenging blower air intake. Two separate ducts are provided, one for crankcase ventilation and one for sludge chamber ventilation. Each of these ducts, or suction lines, is provided with a centrifugal oil separator, which is located near the suction intake of the blower.

As the vapors are drawn through the separator, all suspended oil is thrown out, due to the increased velocity and rotary motion caused by the vanes in the separator. After passing through the separator, this mixture of vapors and air must also pass through a filter unit before entering the blower suction. This filter unit effectively removes all trace of oil vapors that may still be suspended in the air after it passed through the centrifugal separator.

Working Principle — Method of Operation

During the first few revolutions of the engine in starting, the compression in the cylinders is relieved, but as soon as the engine picks up sufficient speed, the compression-relief gear is cut out and fuel is supplied to the engine. When the cylinders commence firing, the power from the storage battery is shut off. The engine controls are designed so that it is impossible to start the engine on fuel unless the pressure in the pressure lubricating oil system is at least 12 lb. per sq. in. It is, therefore, necessary to operate the motor-driven lubricating oil priming pump before attempting to start the engine.

In a Diesel engine, air is compressed in the working cylinder on the up stroke or compression stroke of the piston to about 500 lb. per sq. in. pressure. The temperature of the air, after compression to this pressure, is high enough to ignite the finely atomized fuel which is injected into the combustion space shortly before the piston reaches upper dead-center. The fuel is injected into the cylinder by a timed fuel-measuring pump which forces the fuel oil through an atomizing nozzle.

Scavenging, i.e., the purging of the working cylinder after combustion of the fuel, is effected through two rows of ports in the cylinder walls which are located on the opposite side from the exhaust ports. The ports in the upper row are controlled by automatic valves which do not open until the pressure within the cylinder has dropped close to atmospheric pressure after the piston has uncovered the exhaust ports. The scavenging air expels the burnt gases and fills the cylinder with fresh air at a pressure slightly higher than atmospheric, so that, at the beginning of the compression stroke, the cylinder contains a greater weight of air than it would contain at atmospheric pressure.

The cycle of operation in the cylinder is completed in two strokes of the piston or one revolution of the crankshaft. Fuel is injected into the cylinder by the fuel-measuring pump, beginning about 36 deg. before the piston reaches upper dead-center. The finely atomized fuel is ignited in the hot compressed air and the gases thus formed drive the piston downward.

Near the end of the end of the down stroke (expansion stroke), the exhaust ports are uncovered by the piston, the burnt gases escape through these ports and the pressure drops to about atmospheric. At this point, the upper row of scavenging ports has already been uncovered by the piston, the automatic valves controlling

the ports are opened and scavenging begins. When the lower scavenging ports are uncovered, additional scavenging is obtained and the cylinder is completely scavenged.

During the following up stroke of the piston, scavenging and the charging continue until the piston covers the exhaust ports. From this point, until the piston covers the upper scavenging ports, the cylinder is being supercharged, so that, when the piston does cover the upper scavenging ports, the pressure of the charge within the cylinder is about equal to that of the scavenging air supply. Compression begins as soon as the piston covers the upper scavenging ports. Fuel injection begins slightly before the upper dead-center, as stated, and the cycle is repeated.

Mechanical and Electrical Features of the Locomotive

The cab, running gear and electrical equipment of the Illinois Central Busch-Sulzer locomotive were designed and manufactured for Busch-Sulzer by the General Electric Company. Referring to one of the tables, overall dimensions and detailed weights are shown. The locomotive develops 36,500 lb. continuous tractive force at 16.5 m.p.h. and 86,500 lb. tractive force, assuming a maximum ratio of adhesion of 25 per cent.

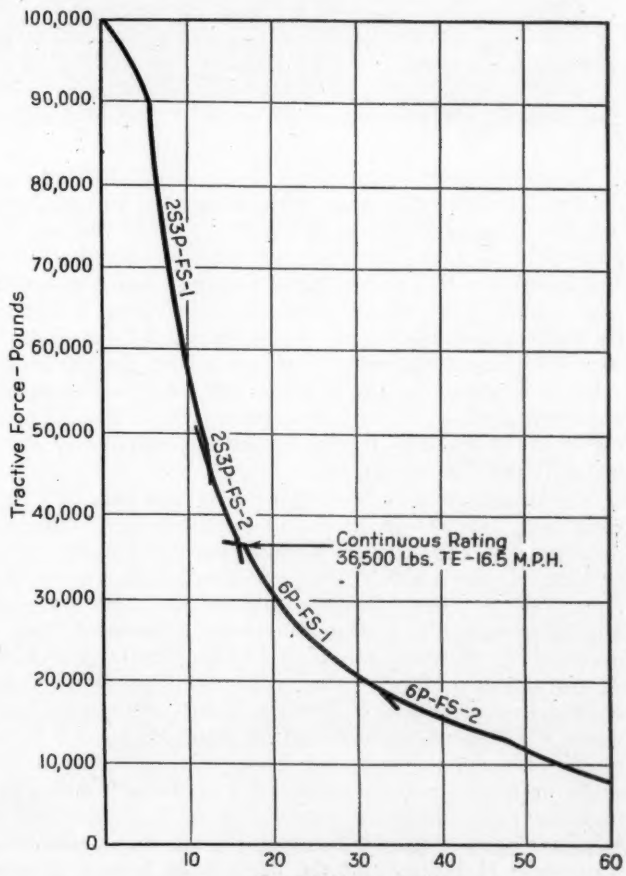
By taking advantage of the maximum bridge loading permitted by the railroad, it was possible to limit the number of axles to six and thereby design a simple running gear consisting of two three-axle, non-articulated swivel trucks upon which the cab is mounted.

The problem of holding the total weight within limits, permitting the use of six axles, was a serious one, without resorting to extensive use of special material in the cab. However, by putting the draft gear on the trucks, no part of the platform carries more than one-half of the drawbar pull; and by using a heavy centerplate, a suitable design was obtained. The trucks, centerplate and cab underframe are designed to withstand a buffing load of 710,000 lb.

The frame of each truck is an integral casting, of substantial construction throughout. A bridge structure is used between the front end frame and the two middle transoms for carrying buffing stresses direct to the center bearing. In the box sections of the side frames, the equalization and semi-elliptic spring systems are carried. Coil springs are interposed between the truck frame and the ends of the semi-elliptic springs to absorb high frequency vibrations. Standard boxes carry 7½-in. by 14-in. journals. Wheels are 39-in. rolled steel with floating babbitt-faced hub liners. The friction draft gear is carried in a pocket cast into the frame. Two 14-in. by 10-in. brake cylinders operate the extremely heavy brake work which is completely equalized. A single flanged shoe is used on each wheel, brake adjustment being made by a turnbuckle at the front end of the truck where it is accessible. Braced and illuminated end steps with splash guards are a feature. The truck design throughout is gaged to stand the punishment of heavy freight work, and the riding qualities are exceptionally good.

Each axle carries a General Electric 300-hp. single-geared motor, axle hung and spring-nose suspended on the truck transom. The truck pedestals carry removable shoes so that wheels and axles may be dropped without disturbing the traction motor. This is done by suspending the motor from lugs on the underside of the cab frame, removing pedestal binders and motor axle caps, dropping shoes and then moving the wheel and axle assembly far enough to one side to clear the motor suspension bearings. The entire assembly can then be dropped, leaving the motor in place. If desired, the traction motor may be removed through a drop pit without untrucking, since removal of the pedestal shoes permits moving the axle far enough to one side for the motor to clear the safety lugs on the truck transom. For hub liner removal, the entire journal box can be pulled off the end of the axle without disturbing the wheels, by blocking the semi-elliptic springs and removing the pedestal shoes. These features facilitate maintenance operations, saving time and money.

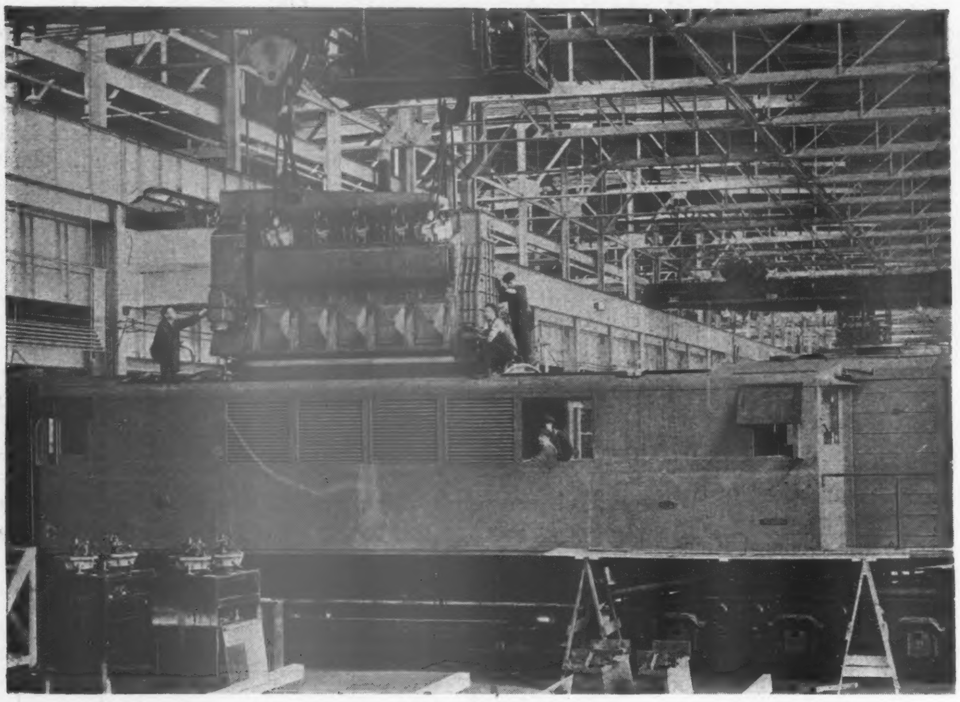
Renewable spring steel liners are provided on journal boxes, pedestal shoes, center plates and side bearings. Case hardened pins and renewable bushings are used in all important points in the brake rigging as well as in all equalizer and spring hanger bearings.



Tractive-force-speed curve

Principal Dimensions of I. C. 2000-Hp. Diesel-Electric Switcher

Length over couplers	60 ft.
Total wheelbase	48 ft.
Rigid wheelbase	11 ft.
Wheel diameter	39 in.
Driving-motor gear ratio	62 to 15
Weights:	
Mechanical portion	144,800 lb.
Engine and accessories	84,300 lb.
Electric transmission and auxiliaries	99,600 lb.
Locomotive, light	328,700 lb.
Locomotive, ready to run	346,000 lb.
Total weight per axle (six)	57,700 lb.
Weight of bare engine	72,000 lb.
Engine weight per brake hp.	36 lb.
Locomotive ratings:	
Continuous tractive force	36,500 lb.
Speed at continuous rating	16.5 m.p.h.
Tractive force, 25 per cent coef. of adhesion	86,500 lb.
Maximum speed	60.0 m.p.h.
Diesel-engine rating and dimensions:	
Continuous rating Busch-Sulzer two-cycle, V-10 engine	2,000 brake hp.
Normal engine speed	550 r.p.m.
Idling speed	275 r.p.m.
Cylinder bore and stroke	14 in. by 16 in.
Crank-pin bearing diameter	14 in.
Brake M.E.P. at 2,000-hp. rating	58.46 lb. per sq. in.
Air compressor displacement (2 comp.)	200 cu. ft. per min.
Fuel tank capacity	1,200 gal.



Lowering the 10-cylinder engine into the cab during construction

The problem of underframe design, with the deflection held to an acceptable value without getting into excessive weight, presented some difficulties, since the engine-generator set alone weighs over 50 tons, and has to be supported on the underframe midway between centerplates 37 ft. 4 in. apart. Only by fabricating the structure was it possible to meet weight restrictions and still secure sufficient stiffness. The success of the design developed is shown by the fact that the total deflection was approximately 3/8 in. at the center, with a bending moment of 11,000,000 ft.-lb., maximum calculated stress being 10,600 lb. per sq. in.

The underframe is 56 ft. 8 in. long and carries a total weight of 219,200 lb. on the two centerplates. The underframe is constructed around the two main longitudinal members which run the entire length, the engine-generator set being mounted direct on them over the middle opening. These members are fabricated from H beams 29 7/8 in. deep, weighing 172 lb. per ft. For 17 ft. 10 in. at the middle of the platform, the original beam section is maintained. Then the beams are tapered to a depth of 18 3/8 in. at each center plate, this section continuing toward the ends for 2 ft. 9 1/2 in., then tapering again until they reach a depth of 4 in, at each end. The two beams are fastened together at each centerplate by a bolster consisting of a heavy top plate, two reinforcing transverse H beams and the main body bolster casting. Further lateral stiffening is provided by cross-tie members made of H beams and channels. The tops of the beams are covered by 1/4-in. and 5/16-in. plates which form the cab floor. This entire assembly is electric welded into a composite whole in which the material has been utilized to better advantage than possible by any other available method of manufacture.

The cab is a box type with radiator assemblies ahead of an operating compartment at each end, the engine room occupying the mid portion. The cab structure is built up directly on the main underframe just described. The side and roof sheets which are respectively 0.109 in. and 0.172 in. copper bearing steel, are electrically spot and line welded to stiffening members, giving a perfectly smooth exterior of pleasing appearance.

The sand boxes, one in each front corner post of the radiator compartments, are filled from the platform. The water and fuel-oil filling connections are reached from the ground. The main lubricating oil system is filled from either end through connections on the corner of the roof and accessible from the steps on the side of each radiator compartment.

Equipment Accessibly Located

The equipment layout is characterized by accessibility and ease of maintenance. The engine-generator set occupies the greater portion of the central compartment, with control and air brake equipment, engine auxiliaries and traction motor blower sets disposed at each end.

Three hatches are provided for taking out engine, generator or other heavy equipment. The top of the engine is made accessible for cylinder head or piston removal by taking off the main hatch cover. Fuel pumps, governor, servo-motors, etc., are located at the free end of the engine and can be worked on from the aisle by removing suitable covers on the end housing. All piping located below the false floor is made accessible by removable flooring; and valves, if covered, are reached through trap doors. Only certain piping and wiring is carried below the floor level, no apparatus being located where it is not readily accessible from the aisles, with the exception of the lower brush-holders of the main and auxiliary generators, which can be reached through suitably located hinged doors.

A lubricating oil tank is located in each radiator compartment (at ends of the locomotive), being mounted inside the tripod supporting the vertical fan motor. Each of the aphonic-type fans exhausts 57,000 cu. ft. of air per minute through the cone which forms the inner wall of the water tank. At the right, behind the tripod, the door into the operating cab can be seen. At the left is the motor-driven fan on the fin-tube hot water heater which heats the operating cab, as well as the duct for recirculating this air.

The battery, consisting of 56 cells of MVMHT-21,340 amp.-hr. capacity, is mounted in two compartments in the sides of the main girders of the underframe, and is serviced conveniently from the ground. The 1200-gal. fuel tank is of welded construction and is suspended from the cab underframe.

This arrangement, as contrasted with a built-in tank

integral with the underframe structure, avoids the difficulties of keeping the tank tight in spite of underframe deflection and weaving.

The air reservoirs also are suspended underneath, which puts them at the lowest point in the air brake system. This is desirable since it tends to keep water out of the other equipment.

With a view to minimizing maintenance costs, all apparatus is located not easy accessibility in place but also for easy installation or removal.

The Electric Transmission Equipment

The Diesel engine is direct connected through a flexible coupling to the generator, which is the largest traction-type unit yet built. This machine consists of a main and an auxiliary generator, the overhung auxiliary generator armature being mounted on an extension of the main generator shaft beyond the single anti-friction bearing. The engine end of the main generator armature is supported by the coupling. The entire set is longitudinally ventilated by a fan mounted on the coupling end armature head.

The main generator is a 14-pole machine converting an average engine output of 1,930-hp. to traction motor input at a maximum efficiency of 94.4 per cent. Over the entire load range, the efficiency is said to be never less than 93 per cent. The weight of the machine is 18,000 lb. or 9.3 lb. per input hp. at 550 r.p.m.

The traction motor equipment consists of 6 GE-716 single-geared motors, each forced ventilated with 1,500 cu. ft. of air per minute through ducts in the cab underframe and a sliding plate connection. The maximum reduction gearing of 15 to 62 actually permits a maximum locomotive speed of 64 m.p.h. corresponding to 2,280 armature r.p.m., although the maximum permissible speed is nominally 60 m.p.h.

The speed-tractive effort characteristics of the locomotive are the following points:

1. The maximum tractive effort of 100,000 lb., assuring ability to start any train encountered in this service.
2. Continuous rating of 36,500 lb. tractive effort at 16.5 m.p.h., assuring ample electrical capacity.
3. Full Diesel-engine horsepower utilization up to 48 m.p.h., assuring maximum performance of the locomotive for transfer service over a wide range of speed.
4. Transmission efficiency of about 82 per cent to 86 per cent from 15 m.p.h. to 48 m.p.h.

Constant engine horsepower is maintained over a wide range of locomotive speed for transfer service (48 m.p.h. maximum) by a combined exciter and pilot generator belted to the shaft of the main unit and mounted above the auxiliary generator.

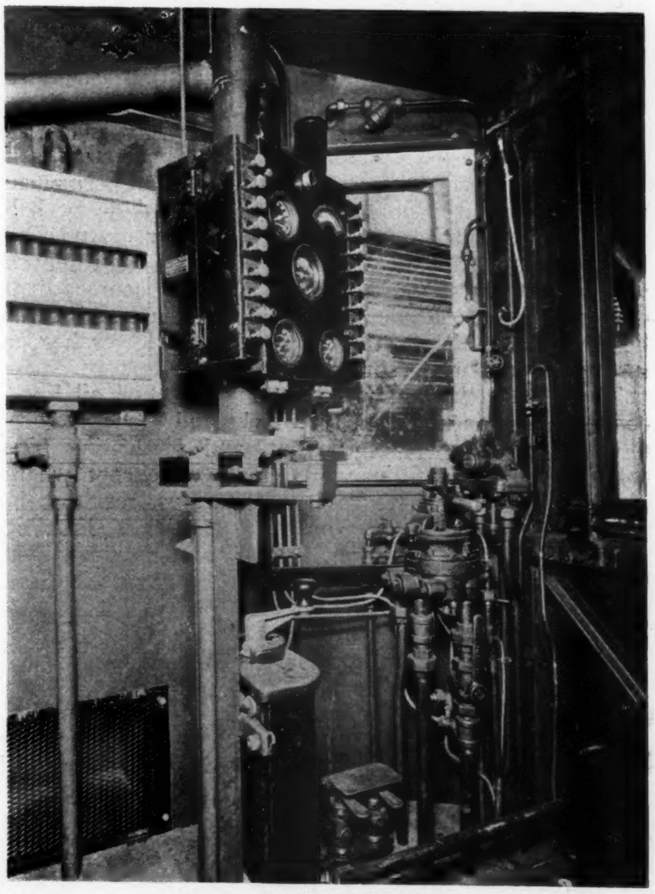
The traction motor control is handled with standard electro-pneumatic contactors and reversers. The locomotive speed is controlled by a combination of Diesel engine speed and traction motor combinations. At each engineer's position are a throttle handle and a controller. The former is connected mechanically to the engine governor. Its position determines the Diesel engine speed in the conventional way. The position of the latter determines the direction of motion of the locomotive. With the controller handle in the high speed notch before the locomotive is started, the motor connections listed above are obtained automatically, and transitions made at the correct speeds as the locomotive accelerates, terminating in the parallel, shunted field connection. This assures maximum locomotive performance and relieves the engineer of the necessity of manipulating the controller handle at each transition.

Excellent visibility is obtained from the engineer's position. Duplate safety glass is used in all doors and windows. The interior of the cab is lined with Silento felt for both heat and sound insulation. The warm radiator compartment on one side, the large air blast hot water heater with re-circulating duct, and insulation assure a comfortable cab even in the severest winter weather in Chicago.

Auxiliaries — Cooling System

The entire auxiliary system is designed for continuous operation at full output regardless of Diesel-engine speed within its operating range. For reliable and satisfactory performance of water cooling equipment, motor ventilation system, battery and compressors, a locomotive designed for long transfer runs or road service needs this.

The auxiliary generator, which is part of the main generating set, as mentioned before, has its voltage held constant over the entire operating range of Diesel-engine speed. The auxiliaries, driven from this source of power, are as follows: "Two 100-cu. ft. (each) displacement two-stage air compressors; two radiator blower sets; two traction motor blower sets; one water heater blower



The operator's control station

and ignition set; and two operating cab heater blower sets. In addition to these, battery charge and power for control and lighting is taken from the constant voltage source.

The engine cooling system was designed to insure sufficient capacity for continuous operation at full horsepower during the hottest weather encountered in Chicago. The Diesel engine has two water circulating pumps, one for each bank of cylinders, and two lubricating oil pumps. One scavenges the engine sump, delivering the oil through filter and radiator to the storage tanks; the other delivers oil under pressure from the storage tanks to the engine bearings. The locomotive has two identical radiator assemblies, one at each end of the cab. The front and one side of each assembly pro-

vides the water radiation, and the other side takes care of the lubricating oil. The water radiators in each end are connected in series with the two pumps on the engine; that is, the entire water system is in series. This insures equalized water temperatures within close limits throughout the whole system. The oil radiators in each end are connected in parallel. Because the engine has two lubricating oil pumps, low pressure sections can be used in the oil radiator, and are duplicates of the water sections.

A feature of the radiator design is the three sided construction providing a large surface exposed to outside air, with the ventilating fan so arranged that almost uniform velocity is maintained throughout the complete air path. This results in obtaining the required cooling with a relatively low fan horsepower. The aphonic type fan is of high efficiency and is surprisingly quiet. The latter feature is very important on an installation of this kind because of the tremendous amount of air handled. The two blowers deliver approximately four tons of air a minute (114,000 cu. ft.) through the radiators.

Series-parallel control of the two motors gives desirable flexibility by permitting economical use of the blowers for a given condition of operation and makes it easier to hold the water temperature within close limits without frequent starting and stopping of the fans. In order to provide the radiating system with greater flexibility for seasonal temperature changes, semi-permanent winter covers are supplied for covering whole or half sides of the radiator during cold weather. And still further, one entire side of each water radiator is equipped with adjustable shutters. The radiator is composed of sections bolted to headers. The intermediate and lower headers are of the floating type with the lower header resting on supporting springs.

Throughout the water, lubricating and fuel oil lines, copper tubing is used, saving weight and space, making a more accessible piping layout, and preventing pipe corrosion. Sweat fittings are employed except where unions are necessary to remove apparatus, resulting in an exceptionally tight piping installation. Flexible metallic joints are used for air and steam connections between cab and trucks, a steam line being installed for eventual use with heater trailers.

Car Wheel Company Enjoys Unusual Distinction

Few manufacturing companies in this country can boast of a continued existence of over 100 years, and possibly only one of having existed for so long a period under the leadership of three men of two generations—a father and two sons. The Lobdell Car Wheel Company, Wilmington, Del., bears this distinction. Its beginnings go back well beyond the period when George G. Lobdell, Sr., was placed in charge of the foundries and machine shops in the summer of 1836.

Some time prior to 1830 Jonathan Bonney, an experienced founder and iron worker, came to Wilmington, Del., established an iron foundry and commenced the manufacture of car wheels. The Baltimore & Ohio Railroad had just been started. About 1830 Mr. Bonney entered into a partnership with Charles Bush, under the name of Bonney & Bush and built a new foundry and machine shop, which had a production of 10 car wheels a day. In 1832 George G. Lobdell, Sr., a nephew of Mr. Bonney, who had been left an orphan at the age of 14, came from Kingston, Mass., to live with his uncle, working as an apprentice in the shop.

In the summer of 1836, while Mr. Bonney was away from Wilmington, the foreman of the shop became ill and Mr. Bush, who was not a practical man, sent word to Mr. Bonney, asking for advice as to what he should do. The word came back, "Put George in charge," and so George G. Lobdell, Sr., at 18 years of age, was placed in charge of the foundry and machine shops. Mr. Bonney died in 1838 and Mr. Lobdell assumed his interest in the partnership, which continued until 1859 under the firm name of Bush & Lobdell.

Mr. Lobdell had shown a special interest in improving the foundry practices and on March 17, 1838, patent 637 was issued to Jonathan Bonney, Charles Bush and George G. Lobdell, covering a wheel of double plate design; the two plates bellied outwardly and extended from the tread to the hub. This design was in successful use for a number of years.

The business expanded so rapidly that in 1844 a new plant was built on the banks of the river, so that raw materials could be unloaded from vessels at its own wharf; this also facilitated direct shipments for export. The capacity of this plant was 150 wheels a day. The foundry was destroyed by fire in 1853 and was replaced with a new one, with a capacity of 200 wheels a day. Mr. Bush died in 1855 and the business was continued by his sons and Mr. Lobdell until 1859, when the latter acquired complete control, operating under his own name.

In 1867 the plant was incorporated under the name of Lobdell Car Wheel Tire & Machine Company, with Mr. Lobdell as president, and William W. Lobdell, his elder son, as secretary. The capacity of the plant was increased to 250 wheels a day. The corporate title of the company was shortened to its present form, Lobdell Car Wheel Company, in 1871. The business had grown to such an extent by 1880, that a new plant was built on the present location, with a capacity of 500 wheels a day.

In 1888 the Master Car Builders' Association and the American Railway Master Mechanics' Association each appointed a committee to confer with representative car wheel manufacturers on the specifications of car wheels. The car wheel makers formed a temporary organization, known as the Association of Manufacturers of Chilled Car Wheels, and six of its members met with the railroad representatives. William W. Lobdell was made secretary of this joint committee, which then proceeded to draft specifications and tests for car wheels.

In 1891 William W. Lobdell secured a patent for an internal rib in the flange section to increase the depth of the chill in the throat, and in 1892 filed claims for a patent on a group of heat treating annealing pits, which could be brought to any desired temperature by passing hot gases through flues interspersed between the pits. This is said to be the real beginning of modern heat treating ovens.

George G. Lobdell, Sr., died in 1894 at the age of 77 years, and his son William W. Lobdell succeeded to the presidency; George L. Lobdell, Jr., the present president was made vice-president and treasurer. Twenty years later, in 1914, William W. Lobdell died and was succeeded as president by George G. Lobdell, Jr.

The present plant has a department for the manufacture of chilled iron rolls for various types of machinery and also for miscellaneous castings. The wheel department has two 84-in. cupolas, with a combined melting capacity of 50 tons an hour. President Lobdell is now in his 86th year, but seldom misses a day at his office.

In appreciation for and commemoration of the long and successful career of the Lobdell Car Wheel Company, the Association of Manufacturers of Chilled Car Wheels held its 29th annual meeting at Wilmington last May.

Link Motion Valve Gear

Part I

By J. Edgar Smith

Designing to achieve the best possible performance from this type of gear

So much has already been written regarding the correct method of laying out the Walschaert valve gear that any suggestion of just another method would be of little interest to the designer who is experienced enough to handle this type of work. But, any method that proposes a different approach to the problem by suggesting standards to be followed and recommends a method of determining these characteristics, should be of considerable interest, providing of course that the theory behind such a method is sound.

At this time, when there is a tendency to consider the possibility of using the poppet valve in place of the piston valve, it seems proper to review the merits and limitations of the piston valve and the Walschaert gear and set down a method of designing so as to achieve the best possible performance from this type of gear. This should not be done in the spirit of "clinging to the old" but rather with the idea in mind that from a clear understanding of the best it is possible to achieve with the present standard as a foundation, we are better able to verify the advantages of the poppet valve and discount its disadvantages.

It will be recalled that although the piston valve had been used to some extent previously, it became standard in 1910 when the superheater came into general use. Up to that time, the Stephenson gear had been adequate for the small saturated steam locomotives equipped with the "D" type slide valve.

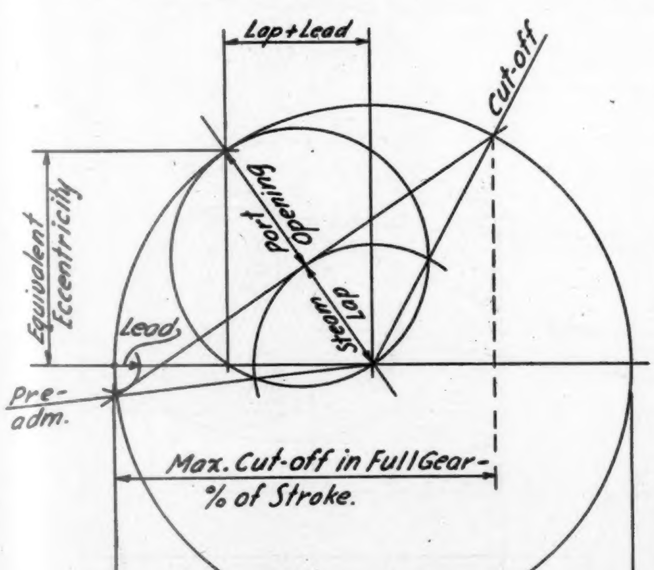


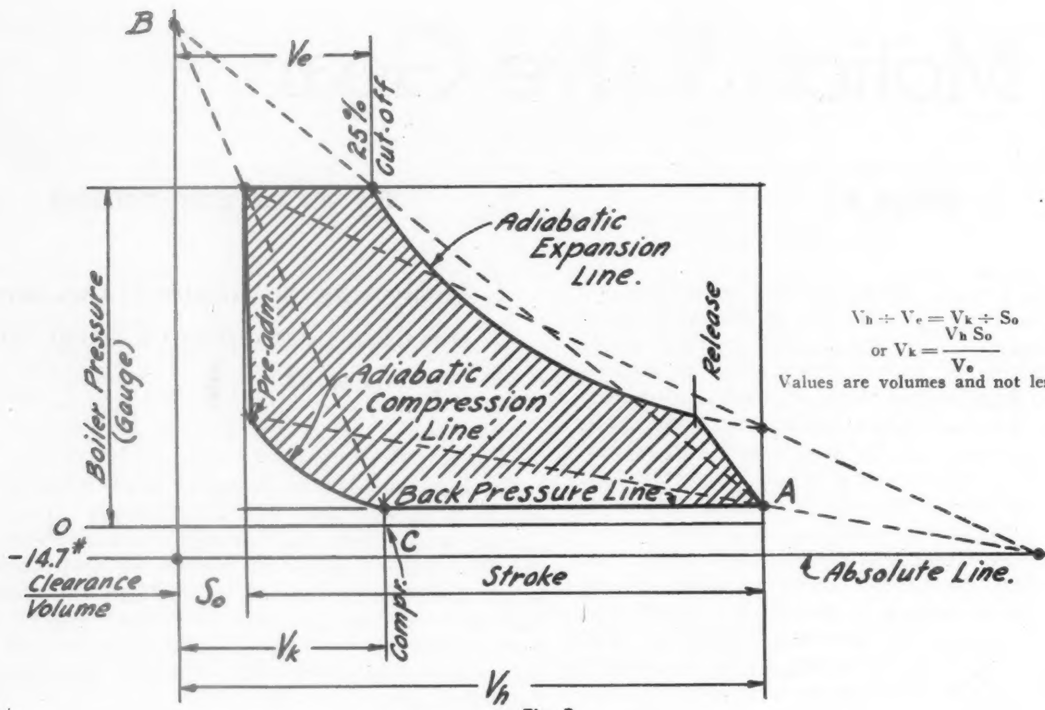
Fig. 1

The higher temperatures of the superheated steam made the acceptance of inside-admission piston valves a logical development. The inside-admission piston valve simplified the problem of valve-stem packings and reduced the frictional resistance of the valve itself. But, with the superheated steam came also higher steam pressures and the consequently greater piston thrusts which reflected through the entire structure of the locomotive. This all opened up the possibility of larger and more powerful locomotives and then greatly increased the sizes of the valve-gear parts. The inaccessability of the heavier eccentrics—located between the frames—paved the way for the acceptance of an "outside" gear.

Being an outside gear and due to its general design, the Walschaert gear has contributed much to the development of the modern locomotive. Its comparatively light parts and their accessability, and the ability to operate the heavier piston valves at higher speeds, has placed it in the position of preference over the Stephenson gear. It is, however, generally conceded that no improvement in steam distribution was accomplished when the slide valve and Stephenson gear were superseded by the piston valve and the Walschaert gear. And, even though the link motion types of gears generally do leave something to be desired in the way of efficiency, they are the only valve gears developed up to the present time that have demonstrated the ability to stand up to the severe requirements of modern locomotive service, particularly in this country, where long runs at high sustained speeds and intensive use of the motive power are common practice. High speed is the crucial test of any valve gear.

In passing, reference should be made to the Baker valve gear. While this is not a radial-link-motion gear, in the strictest sense, the same effect is accomplished by a system of bell cranks and levers as is done by the sliding block and radial link of the Walschaert gear and it may therefore be considered under the same general classification. Like the Walschaert gear, it has stood the test of present day requirements. With the same travel, steam lap and lead there is practically no difference in the movement derived from either gear, although the Baker gear has greater travel capacity. This capacity alone has had much to do with the popularity of the Baker gear since the introduction of the limited-cutoff feature.

The adoption of the limited-cutoff feature to the design of cylinders, the consequent still higher boiler pressures, larger diameters and greater port areas, made necessary still larger piston valves, wider ports and longer valve travels. The increased speed required of the present-day passenger, as well as freight types of locomotives, has brought us to what is believed to be the limit of the possibilities of the present standard valves and valve gears. We are now at a point in the development of the art of locomotive design where something more than just increasing the size of the



$$V_h \div V_e = V_k \div S_o$$

$$\text{or } V_k = \frac{V_h S_o}{V_e}$$

Values are volumes and not lengths.

Fig. 2

piston valves and increasing the size and strength of the valve gear parts may be necessary. These details already have reached such proportions as to require so much power to overcome their own inertia, that it is evident future development may have to be in another direction.

A few railroads in this country are now experimenting with poppet valves in the hope that they will furnish the solution to the problem. But, before attempting a study of the different types of valve gears in use today for operating poppet valves and consideration of the improvements necessary for the realization of all the advantages of the poppet valve, it appears logical to analyse first the present standard piston valve and the Walschaert valve gear with the idea of designing to achieve the best possible performance of the locomotive from this type of gear.

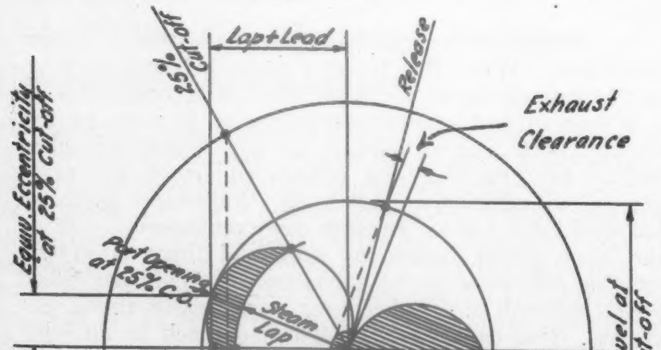


Fig. 3

For actually laying out the Walschaert gear there is little difference in the various methods used. Some designers prefer to calculate the lengths and proportions of all the members. Others depend entirely upon

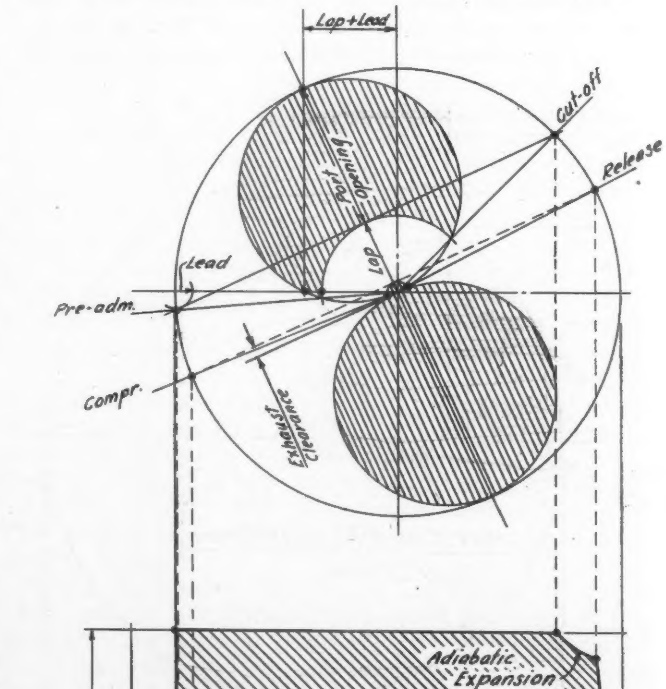


Fig. 4

the layout. In either case, the layout is based on given valve characteristics.

When something more than just a valve gear layout to meet certain valve events is required, i.e., a design of a valve gear to meet certain operating conditions, the problem takes on an entirely different aspect. For the designer who has had a wealth of experience with all types of locomotives which are operating under all the many different conditions of service and has at hand actual indicator cards taken from the cylinders operated by valve gears which he has designed, the problem of determining the valve events for the locomotive under consideration is comparatively simple.

Selecting the Valve Events

Unfortunately, many who are called upon to design Walschaert valve gears, have not had this experience and consequently must refer to published Standard Valve Settings. Also, very little has been published to date regarding recommended valve settings for valve travels over 7 in., and even those published recommend events for standard locomotives operating under average conditions. Therefore, in order that the designer may determine the proper valve events to be provided for in the design of the locomotive he has under consideration, the following method is suggested. Instead of arbitrarily selecting the valve travel, lap, lead and exhaust lap (or clearance), it is recommended that only the following be selected:

Valve Travel—From 8-in. to 8½-in. travel is about the practical limit of the Walschaert gear. The 8-in. travel will give good results for passenger locomotives, while the 8½-in. travel may be used for freight locomotives, providing the general proportions of the locomotive are such that the limiting angles of swing and limiting proportions of levers are not exceeded. In that case, it may be necessary to drop back to 8¼-in. travel or even to 8-in. In either case, with a valve travel of from 8 in. to 8½ in., the longest steam lap possible will be obtained for the class of service under consideration.

Cutoff—Since too late maximum cutoffs in full gear intensify the problem of getting rid of the steam properly—especially in passenger locomotives—and lessen the economy of the performance, there is little object in holding to the mistaken idea of the necessity of real long cutoffs. A cutoff of 85 per cent is sufficient to produce the rated tractive force of the locomotive and need not be exceeded. However, if the weight of the locomotive will be sufficient to maintain a liberal factor of adhesion and it is desired to favor the starting power at the expense of a trifle less economy, the maximum cutoff in full gear for freight locomotives, which will be required to start heavy trains frequently, may be set at 88 per cent.

Lead—The lead, which is only the width of port opening at the beginning of the stroke, is, contrary to the general impression, of no great importance except that it, in combination with the valve travel and lap, contributes to the port opening at short cutoffs. The longer leads produce greater port openings and therefore the longest lead is given to passenger locomotives,

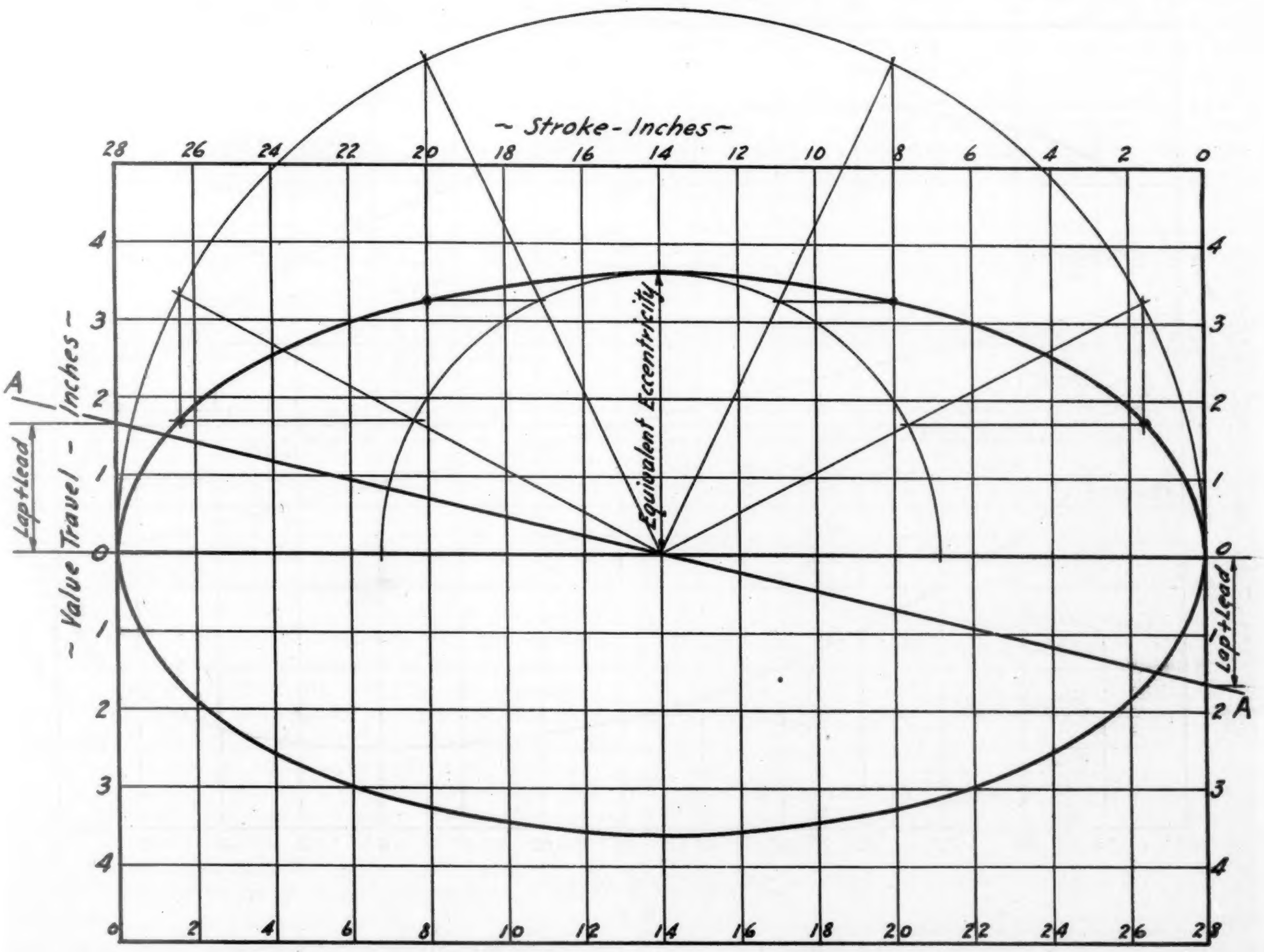


Fig. 5

in order that the greater port openings at the short cutoffs will be available for producing the horsepower necessary to propel the locomotive at the higher speeds. The standard leads are as follows:

Lead	Service
5/16 in.	Fast passenger
1/4 in.	Passenger
1/4 in.	Fast freight
3/16 in.	Freight
1/8 in.	Switching

With these important events decided upon, viz., the valve travel, maximum cutoff in full gear and the lead, the lap, equivalent eccentricity and pre-admission can be determined by laying out a Zeuner diagram as in Fig. 1.

Steam Lap—Contrary to the general opinion, the steam lap is of no greater importance than the other steam events. For a given valve travel, lead and maximum cutoff, the lap can be but one width. The lap does have a direct influence on the amount of port opening, which is of great importance, but any increase in lap can only be accomplished by either shortening the maxium cutoff, shortening the lead or increasing the travel.

Pre-admission—Like the cutoff, pre-admission is the effect of the travel, lap and lead. At full gear the pre-admission is unimportant providing the lead is correct and at the short cutoffs the pre-admission increases proportionately.

Lap Plus Lead—In the Zeuner diagram the lap plus lead represents the motion derived from the combination lever alone.

Equivalent Eccentricity—In the Zeuner diagram the equivalent eccentricity represents the motion derived from the link alone.

Selecting the Exhaust Events

The selection of the proper exhaust events is equally as important as that of determining the steam events. While it is true that with the piston valve and the Walschaert gear there is a fixed relation between all the events, throughout the full range of cutoffs under any given set of conditions, it is possible to determine at what point in the stroke the compression should be set to approach, as nearly as possible, the theoretically perfect cycle of events. This point, however, should be selected as a means of determining the proper exhaust lap (or clearance), rather than as the result of selecting an exhaust lap (or clearance).

Prof. Stumpf has developed a method, which may be plotted graphically or calculated from the formula given, for selecting the point of compression, based upon such characteristics as cylinder volume, clearance volume, working pressure and back pressure. This method was the result of a study of the losses due to excessive cylinder clearance volumes, particularly with reference to the Unaflow cylinder. However, the same principles are involved in the study of the losses due to excessive cylinder clearance volumes in the multi-flow cylinder. Unquestionably, any method that will aid correctly in the selection of the proper point of compression for the Unaflow cylinder will apply equally as well to the multi-flow locomotive cylinder.

A study of actual indicator cards taken, at or near running cutoff, from locomotives which are known to operate smoothly and economically, will, when checked by this method, be found to hold surprisingly close to the proper point of compression thus found.

Running Cutoffs—Since, as stated above, there is

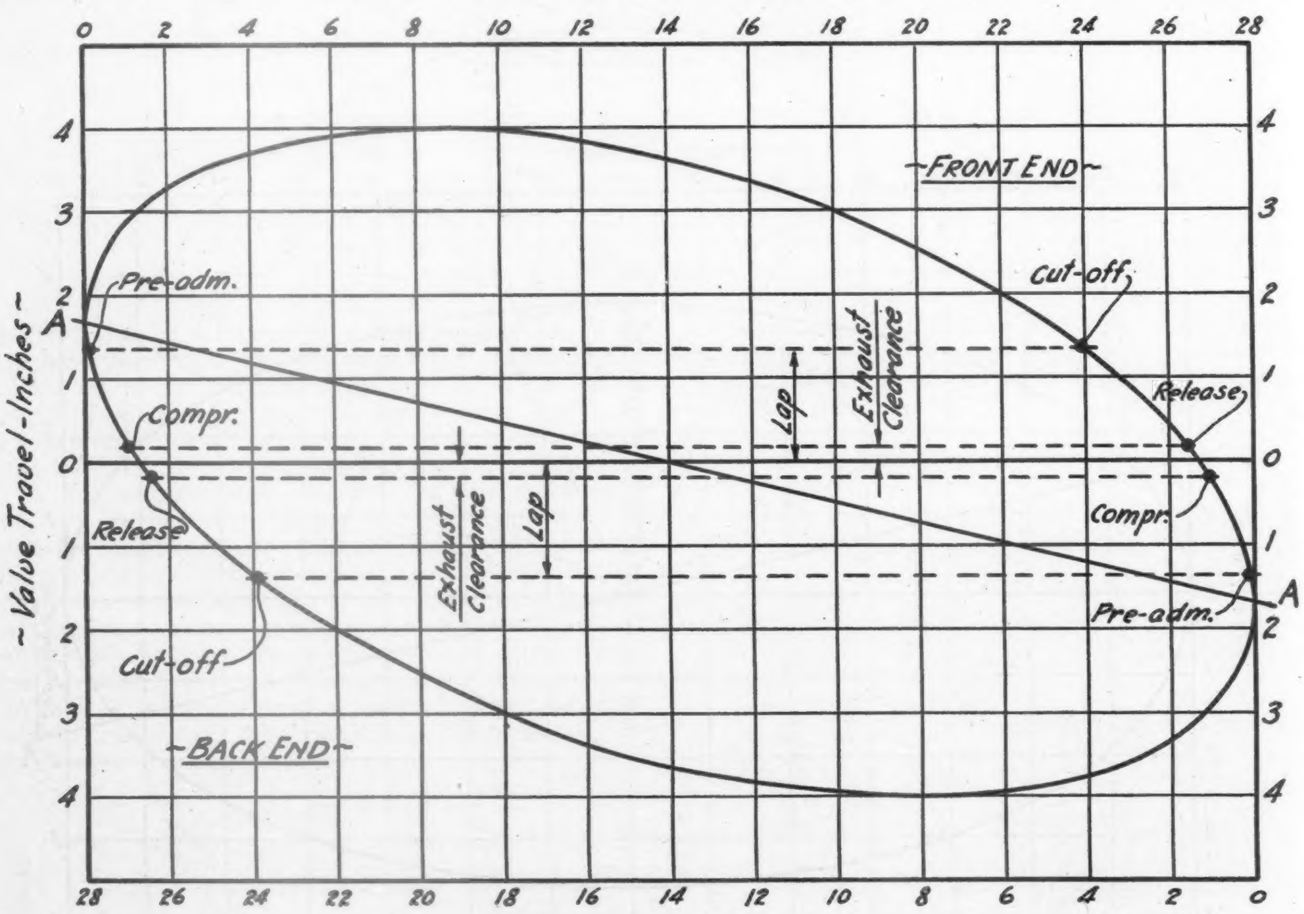


Fig. 6

a fixed relation between the steam and exhaust events as produced by the piston valve and the Walschaert gear, and which cannot be altered for the different cutoffs, the proper point of compression should be determined at running cutoff. Some variation is to be expected at full gear but we are concerned most with the economical performance of the locomotive at the cutoff at which it is used most for the longest periods of time and, therefore, our next concern is to determine the running cutoff for the locomotive under consideration. Briefly, we may be guided by the following running cutoffs for locomotives in the classes of service shown:

Cutoff	Service
25 per cent	Fast passenger
25 per cent	Passenger
33 per cent	Fast freight
50 per cent	Freight
66 per cent	Switching

Determining the Proper Point of Compression

Having selected the running cutoff, the proper point of compression may be found by either the graphical method shown in Fig. 2 or by use of the formula accompanying it.

Determining Release and Exhaust Lap (or Clearance)

With the maximum valve travel, lead, and lap as found in Fig. 1, this Zeuner diagram, Fig. 3, can be constructed for 25 per cent (running) cutoff. By laying off the point of compression as found in Fig. 2 and completing the diagram, the point of release and the exhaust clearance (as occurs in the example shown) can be determined.

Theoretical Indicator Card

With the exhaust clearance as found in Fig. 3, the completed Zeuner diagram and theoretical indicator card can then be drawn as in Fig. 4.

Theoretical Valve Ellipse

Before calculating the actual lever proportions necessary to produce the desired valve events, the characteristics obtained by the Zeuner diagram may be used to construct theoretical valve ellipses, as well as theoretical indicator cards. Since the valve ellipse represents the combined effect of the motion produced by the combination lever and link, it is necessary to analyse first the motion produced by each, separately, and then combine them to produce the valve ellipse. Referring again to Fig. 1, the lap plus lead represents the motion produced by the combination lever alone and the equivalent eccentricity represents the motion produced by the link alone. The valve travel is a combination of these two motions.

It is advisable to lay out a valve ellipse blank to the same scale as that usually used in connection with a valve gear model. As in Fig. 5, line A-A will represent the motion produced by the combination lever alone. In order to plot the motion produced by the link alone, an ellipse may be constructed geometrically, using the stroke of the piston as the major axis and the equivalent eccentricity as the semi-minor axis.

By combining the motions represented in Fig. 5, as A-A and the ellipse, the combined ellipse constructed about axis A-A, as in Fig. 6, will represent the theoretical valve ellipse. While this theoretical valve ellipse will not be exactly as would be taken from a valve gear model, it will be just as accurate to use for comparing the valve performance of one locomotive with another as the theoretical indicator card is for comparing the cylinder performance of one locomotive with another. By the same method as just described and with the equivalent eccentricity at running cutoff as found in Fig. 3, the theoretical valve ellipse for running cutoff may be plotted.

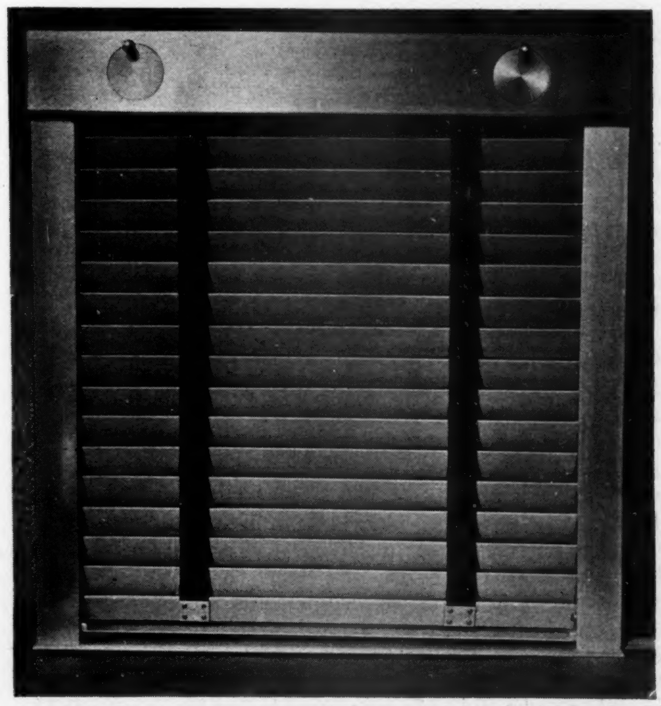
(To be continued)

Metlvane Blind For Passenger Cars

An aluminum-slat blind, recently placed on the market by H. B. Dodge & Company, Chicago, is designed especially for use in railway passenger cars. It is similar in principle to the popular Venetian blind successfully used in homes and offices. It is attractive in appearance and noise-proof in construction.

Doubtless the most important feature of the Metlvane Blind, as it is called, is its control of light. By shutting out direct rays, it eliminates shadows and contrasts and distributes a soft, uniform light throughout the entire car. With the slats tilted at the proper angle, a passenger may sit with complete comfort in any seat and enjoy a relatively unobstructed view outside. Likewise the blind provides complete privacy without shutting off the exterior view.

Beauty is merged with utility in the blind design. The horizontal aluminum slats preserve a streamline effect on both the interior and exterior of the car. Satin-finish



Metlvane blind operated by two small disc-type handles at the top

aluminum frames can be readily made an important element of the interior decorative treatment. Though distinctly modern in appearance, the blind fits well into any scheme of decoration.

Mechanically, the Metlvane Blind is a single unit built into a solid frame of extruded aluminum, which may be easily removed and replaced. All mechanism is concealed, and there are no apertures of any kind in the slats (as in the ordinary Venetian blind) to admit sun rays. The slats are constructed of an aluminum or stainless-steel covering over a thin strip of wood, which eliminates metallic ring. The slat ends are insulated with cast rubber capping to prevent rattle and vibration.

Even when the slats are tightly closed and set together, no noise from them is detectable in a train moving at any speed.

Two types of the blind are now being developed, each of which may be easily operated without effort or inconvenience. The first of these, illustrated, is operated by means of two small, revolving, disk-type handles built into the top fascia. One of the handles regulates the tilt of the slat, while the other controls the raising and lowering of the entire blind. A generous ratio of mechanical advantage assures easy operation in a minimum of time.

In the second type, not illustrated, raising and lowering of the slats in the side grooves is accomplished by means of a counterbalanced, self-locking bottom bar. By grasping the bottom bar, a passenger may readily raise or lower the blind to locked positions when up or down, which are really the only two correct positions to give maximum efficiency. The tilting device in this type consists of two small cords projecting from the side of the frame, at the fingertips of the passenger. Both types are of a simple, practical design which keeps original and upkeep cost at a minimum.

In cars, fitted with the customary type of window shades, the pocket of heated air present between the window pane and the drawn shade serves as a heat reservoir, detrimental to the comfort of passengers, even in air-conditioned cars, since this air cannot escape and be mixed with the treated air. The small spaces between slats in the new blind eliminate this closed pocket.

What Would You Have Done?

We have had a number of reactions in recent months to the little enginehouse drama which was presented in the *Railway Mechanical Engineer* of October, 1935, page 423. The S. M. P. took rather summary action in dealing with an infraction of the rules on the part of Bill Jones, the roundhouse foreman. A better handling of the case was suggested in our December number, page 517. Another communication was published in the February number, page 64.

Without understanding that more than one of their number had been asked to take over the assignment, several apprentices of the Grand Trunk Western at Battle Creek, Mich., were asked by the apprentice instructor to tell in writing what they would have done, had they been the S. M. P. Their reactions follow and speak highly for the discernment of these young men.

"Considering the good record of the workman and his ability, also the circumstances regarding the work at that time, I believe that the foreman used the best judgment in doing as he did. He was considering his responsibility in getting the engine out, since he realized there would be no excuse if he failed to have it ready for service. After hearing the explanation I would reinstate the foreman, after censuring him and the workman mentioned." —*Walter Venn.*

"I believe in all sincerity that the S. M. P. in this case acted impulsively without taking into consideration the foreman's past record. I would have asked for all particulars before drawing conclusions. The foreman had many merits, among them truthfulness and a desire to do his work well, as well as experience. It seems his only fault was an infraction of rules when he knew of no other means in order to accomplish his work. Therefore, I believe that a reprimand and not demotion would have been just punishment."—*Johnny Bond.*

"The circumstances of the case, as outlined in Scene III, seem to me to exonerate Bill Jones completely. His actions were those of any truly good foreman under the circumstances. He did not approve of the air-brake repairman's conduct, but he was sufficiently broadminded to realize that all humans must have their shortcomings and that the man's previous good record deserved some consideration. The man's services were necessary to carry out the superintendent's own instructions and a little common sense on the part of Bill Jones was the means of saving revenue, reputation and temper.

"The superintendent was plainly prejudicial in his condemnation of Bill Jones. He was determined to stamp out what he felt was a terrible condition, and all without endeavoring to understand the true situation. The day of 'tough guy' executives is gone. The man with the patience, courage and reasoning to be a leader, rather than a driver, is the man of true executive ability.

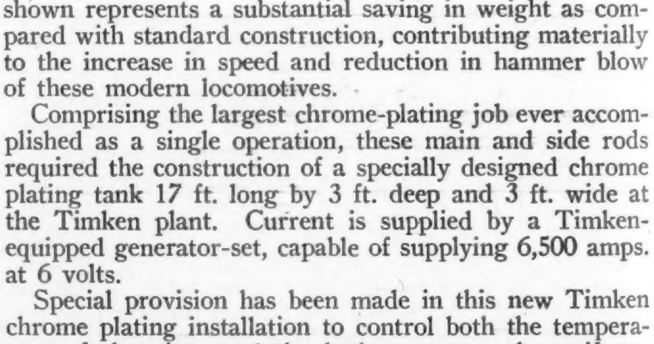
"In conclusion, let me say that had I been the S. M. P. I should certainly have fully apologized to Bill Jones for my hasty action and requested that he continue his duties as roundhouse foreman. Then, along with an honest effort to help him find a reasonable source of pride and pleasure in his position, I should have resolved to make myself a better, more understanding and less intimidating executive."—*Ernest Nightingale.*

Largest Chrome-Plated Locomotive Main Rod

The chrome-plated, heat-treated, alloy-steel locomotive main rod, illustrated, is one of a set consisting of two 12-ft. main rods and four 9-ft. side rods designed and built by the Timken Roller Bearing Company for use with their bearings on heavy duty, high speed steam passenger locomotives. Weighing only 510 lb., the rod shown represents a substantial saving in weight as compared with standard construction, contributing materially to the increase in speed and reduction in hammer blow of these modern locomotives.

Comprising the largest chrome-plating job ever accomplished as a single operation, these main and side rods required the construction of a specially designed chrome plating tank 17 ft. long by 3 ft. deep and 3 ft. wide at the Timken plant. Current is supplied by a Timken-equipped generator-set, capable of supplying 6,500 amps. at 6 volts.

Special provision has been made in this new Timken chrome plating installation to control both the temperature of the piece and the bath to assure the uniform,



Chromium-plated main rod designed for heavy service, weighing only 510 lb.

dense coating required to withstand the severe conditions to which locomotive parts are exposed.

A 7½-hp. exhaust system, capable of handling 12,000 cu. ft. of air per min., was installed in connection with this new tank and duplicated for the other tanks to eliminate the possibility of danger from the fumes. Provision is made in this installation to salvage chromic acid from the fumes by washing them as they pass through the exhaust system.

Clinchfield Rail Lubricator

After several years of experimentation and road service tests, a rail lubricator has been developed on the Clinchfield which seems to give highly satisfactory results. The device, which is applied to the rear truck of a locomotive tender, is operated over the Clinchfield line twice a day, once in each direction, thus oiling the tracks twice a day. Of the 276 miles of line, there are 118 miles of curves, 85 of which vary between 3 deg. and 14 deg. The oil consumption is 6½ gal. per mile of curves per month, and the cost is $0.94 per mile of curves per month. It is estimated that at least $30,000 a year is saved in the renewal of curve-worn rail alone. No attempt has been made to calculate the saving in flange-wear of wheels, but it is felt that the lubrication of rails on curves has caused a considerable decrease in flange wear as well as a decrease in number of derailments.

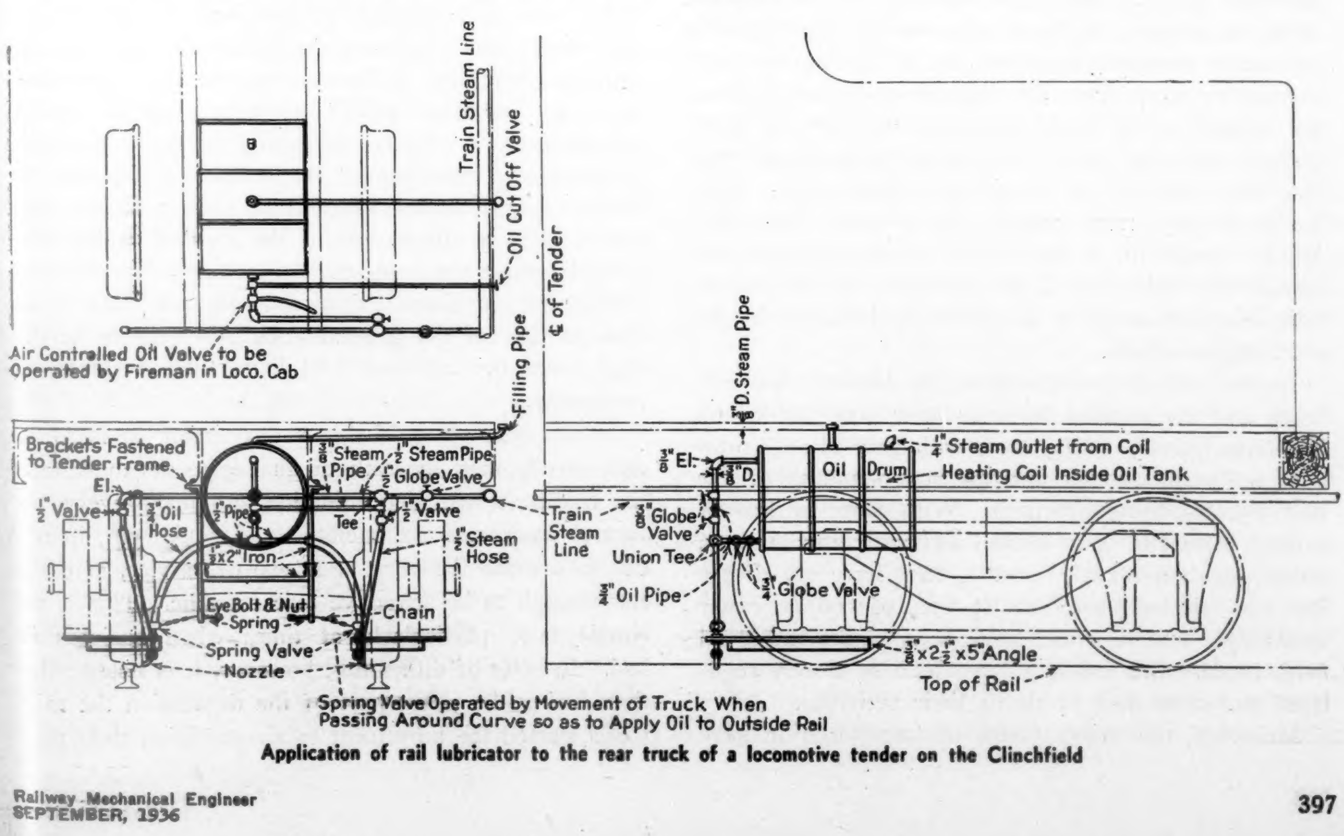
This device, as shown in the drawing, comprises an oil drum and pipes located under and fastened to the center sills, ahead of the rear truck of the locomotive tender. The drum is an ordinary metal oil barrel of about 50 gal. capacity. The oil is fed through pipes to nozzles located near the level of the top of the rail and directed at the inside of the rail head. A steam connection is also made at the nozzles. Near the nozzles are located self-closing spring valves in the oil line, arranged with chain connections so that when the truck swivels on a curve, the valve to the outside rail is opened and the steam jet deposits the oil on the rail. The nozzles and valves are fastened to the truck, and hose connections or flexible joints are applied in the steam and oil pipes to provide flexibility.

The present device is a gradual development from an earlier application which consisted of a drum of oil on top of a tender and valves manually operated by a section man located in a monkey box on the tank. So far as is known, the device is not patented.

The oil used in this rail lubricator consists of a heavy viscous oil thinned to the desired consistency. The successful operation of the device requires the sympathetic attention of both road and shop employees to see that the nozzles are kept in proper adjustment and condition.

The steam flow to the nozzle is controlled manually. The valves in the steam line are set to give the desired amount of steam and the steam blows continuously whether any oil is flowing or not. The spring valves, which cause the oil to flow when the truck swivels, are closed on tangents, opened a small amount on light curves, and opened wider on heavy curves. It is necessary to maintain a close adjustment of the nozzles to prevent an undue amount of oil being deposited on top of the rail. An inspection is made at the end of each trip, and if, as sometimes occurs, the oil gets on top of the rail, sanding is necessary to prevent driving wheels slipping.

The present device has been changed somewhat from that shown in the drawing by replacing the oil hose with a ½-in. pipe enclosed in a larger pipe to which side pipe connections have been welded. Steam to the nozzles is passed through the outside pipe thus forming a steam jacket for the inner oil pipe. With this arrangement, and the steam jet blowing all of the time, no trouble is experienced in using the device in sub-zero weather. As a further means of assuring reliable operation, a tee, located at the junction of the steam and oil lines, is equipped with a small nozzle forming a steam jet on the inside of the tee which provides a syphon action to assist the uniform flow of the oil when the spring valves are open.



Application of rail lubricator to the rear truck of a locomotive tender on the Clinchfield

EDITORIALS

Survival Of the Fittest

The machine age brought with it tremendous benefits but many difficult and preplexing problems. For one thing, it made possible the steam locomotive and the railroads. As a result, this vast continent with its almost unlimited natural resources, was opened up for development. The coming of the mass production era early in the present century and the more intensive applications of science and machinery to aggriculture, resulted in much higher standards of living and intensified the shifting of populations.

Progress in the development of our material resources has been further speeded up by the tendency in more recent years to intensify scientific research in almost every field of human endeavor. As a result we have seen the introduction of many new and novel products and the building up of a variety of new industries. Even the depression through which we have passed could not stop this tendency. One might have assumed that at such a time markets could be found for only the necessities of life. It is significant, however, that new products which cater to our comfort and convenience, and which in no sense are necessities, were introduced and successfully sold because of their novelty and the use of up-to-date merchandising methods in promoting their sale.

Most, if not all, of these new products and new industries come into direct competition with older established products and organizations. In the railroad field, for instance, we have witnessed the rapid growth and active competition on the part of the highway and airway carriers. The older industries ordinarily have the benefit of a sound financial structure, a well-trained personnel, and a successful background. On the other hand, the newer industries recruit their forces largely from among the younger men and move forward in a fighting spirit with energy and confidence, unhampered by traditions or inhibitions which sometimes exert a controlling influence in the older organizations.

In the field of transportation, the highway bus and truck and the aviation interests have been headed up by comparatively young men, with new ideas, up-to-date technical training and an understanding of the best merchandising practices. With more or less of a clean slate and open minds, and with little, if any, public regulation until recently, they have cut deeply into the railroad business. It was, of course, easier to do this than it would have been in the industrial field, because the railroads have been so closely regulated and controlled in all of their activities.

Moreover, the newer forms of transportation have been aided by government in the provision of highways and airways, whereas the railroads have had not only to provide expensive rights-of-way, but have had to pay heavy taxes on their valuation, these taxes going not to the promotion of transportation, but to help finance government. Fortunately, the Congress and the various state legislatures are awakening to the unfairness of allowing unregulated competitors to fight the railroads, which are so securely tied down by all sorts of regulation—federal, state and municipal.

In speaking at the Ninteenth Annual Conference on Industrial Relations at Silver Bay, N. Y., on current industrial problems arising out of transition from depression to prosperity conditions, Prof. Erwin H. Schell, head of the department of business and engineering administration of the Massachusetts Institute of Technology, emphasized the fact that the older industries must be keen to recognize and organize to meet competition from the newer industries, with their youthful personnel and energy. How is this to be done in the case of the railroads?

Obviously, the task must be approached from several angles. For one thing, every possible effort must be made to inform the public as to the facts about the railroads and their competitors, in order that they may all be treated alike, so far as regulation is concerned, and that no form of transportation shall be unfairly handicapped, as compared to the others. This is a matter that has received much consideration in recent years. In many places the railroad workers have been instrumental in forming strong railway employees' and taxpayers' organizations; the Association of American Railroads has recently embarked upon an ambitious public relations program, which promises to be effective in giving the general public a better understanding of the services which can be rendered by the railroads and of their problems and needs. These efforts are in the right direction and should receive the support and backing of every railroad employee, since it is directly to their interest, as well as that of the general public, to remove handicaps from the railroads and have them restored to prosperity.

In the next place, if this new competition is to be successfully met, the railroad managements must face the challenge with determination and make every effort to modernize the facilities and equipment, in order to provide the very best type of service, at costs low enough to be attractive to the public. This is no simple task, particularly at times when business is bad. In spite of difficulties, however, it is noteworthy that during the worst part of the depression the railroads started the movement to air condition their pas-

senger cars and to introduce the light, high-speed passenger trains. The very fact that the railroads had the nerve to undertake innovations of this kind under such conditions has made a most favorable impression on the public at large, and today they stand much higher in public estimation than they have for many years.

Passenger and freight services have been speeded up. Judging from the expressions from various elements of the traveling public, there is a need in many places for more frequent service. It would appear that the railroads have gone too far in cutting down some of their services and that there are possibilities of operating light, high-speed equipment at frequent intervals, which will help to regain business which has been lost to the private and common carrier automobile.

Improved schedules of this sort, however, will not be nearly as effective as they might be, unless railroad employees take a lesson from the highway and airway employees and render a larger degree of courtesy to the traveling public. One constantly is confronted with criticisms of grouchy railroad employees, in comparison to the courtesy and aggressively helpful attitude of the men who operate highway vehicles or the airplane services. If railroad employees would show the same interest in the traveling public and extend the same courtesies as the employees of these newer forms of transportation, a large amount of business would quickly return to the rails, and this applies to both passenger and freight services.

The mechanical department employee, who does not come in direct contact with the traveling public, cannot escape the fact that there are ways in which he can exert a helpful influence in improving conditions and lowering the costs of maintenance. Officers, supervisors and employees have grown old in the service and possibly have fallen into ruts. Have they kept abreast of developments, so that they can match the efforts of the younger group in the newer forms of transportation? Are they awake to the up-to-date improvements and operation of machinery and facilities, and are they keen to take advantage of new ideas? The art of supervision has become more or less of a science. It is true that nothing can replace common sense and the right sort of personality on the part of the supervisor, and yet there are ways of dealing with their associates and the workers that may be much more productive of results than those they are now using.

Are proper efforts being made to see that the older workers in the organization are carefully coached and trained so that they can handle the new equipment and tools properly and can improve their abilities and skills to meet present day demands? Railroad mechanical department officers have not thought over-much of training, even of apprentices, but many industries today are awakening to the fact that they have a responsibility for the continuous training of the workers throughout their service life. What is being done in your department in this respect?

The best young men should be recruited into the organization as rapidly as conditions will permit. This will help to average down the age of the organization and, if rightly selected and trained, these young men can be a large factor in improving the efficiency of operation in the years to come. Shall we be content with just ordinary, old-fashioned methods of recruiting and training apprentices, or shall we take advantage of the best thought and experience and develop apprentice training systems that will be most effective? It is significant that the railroads in the early part of the century, when the Santa Fe and the New York Central started their apprentice systems, were leaders in this respect in the entire industrial field. Can the same thing be said today?

If we are to meet successfully the new competitions, we must keep our organizations wide-awake and alert to take advantage of every factor that will help to improve the efficiency and economy of operation. Are we doing so?

Utilize the Experience Of Tool Makers

Not only is the machine equipment in many railway shops generally old and inadequate for the handling of work on a modern production basis, but some of the newer machines recently installed are limited in productive capacity by the failure to provide modern cutting tools, and particularly the necessary instructions regarding how to care for, grind, set up and operate these tools for the best results. In all of these particulars, railroad shop men will be well repaid in taking the trouble to familiarize themselves with the best practices in other railroad shops and also in industrial machine shops having extensive specialized experience.

This is particularly important since the advent and more general use of new metals in locomotive and car construction, including alloy steels, aluminum alloys and other special metals. Each of these materials brings its specific problems in satisfactory machining. Take, for example, the drilling and tapping of Alleghany steel and Monel metal. Great trouble has been experienced in performing these operations with what might be termed standard speeds. With drills ground with the standard commercial point, constant jimmying, jamming and breaking of the drill lips occurs and it has been found necessary to flatten the drill point, decrease the speed about 50 per cent below that generally used and complete the hole drilled without stopping.

Important questions regarding the size and type of cutting tool to use are constantly pressing for authoritative answer, as, for example, when to use formed vs. profile milling cutters, how to determine the rake and spiral necessary for the best cutter performance, when to use inserted blade or solid cutters, how to decide on hobbing vs. milling gear teeth, how to specify

the cutting feeds, speeds, lubricants and method of lubricant application which will produce the best results. Reaming holes for taper pins is another job which introduces complications unless reamers are provided having the correct general characteristics for each different type of job. Questions of how much power to provide and what machine adjustments can be made to prevent tool chatter are fundamental.

Too much stress cannot be laid on the importance of buying quality high-speed cutting tools, designed for their particular work, and then seeing that these tools are suitably cared for and properly ground for the different metals being cut. Most small tool manufacturers issue more or less comprehensive instructions regarding cutting feeds, speeds, etc., to be used with their tools in different materials. In the case of at least one manufacturer, this educational work is supplemented by the issuance from time to time of up-to-the-minute data sheets to be inserted in a loose-leaf engineering bulletin which represents years of experience and research in practically every phase of work that high-speed tools are called upon to perform. In addition, this company maintains an engineering inspection force qualified to analyze either ordinary or unusual machine-shop operations and offer valuable suggestions on improving work or increasing production.

One fact is quite evident. With the volume of machine-shop work now confronting railways in their effort to catch up on deferred maintenance of both cars and locomotives, no source of authoritative information and help in bringing small cutting tool equipment in railway shops up to standard should be overlooked. The extensive experience of the ablest tool experts of both the railways and the small tool manufacturers should be fully capitalized.

Familiarity Breeds Contempt

The well-known expression "Familiarity breeds contempt" is never truer than when applied to everyday operations in railway locomotive and car shops where, in the performance of many specific jobs, a certain element of danger exists unless unremitting care is taken to avoid it.

The article in the July *Railway Mechanical Engineer* pertaining to shop safety signs drew an interesting comment from a superintendent of motive power who says that the question of safety signs can be greatly overdone and that one or two signs, posted in a conspicuous place and changed frequently, seem to give better results. Moreover, the practice of having ten-minute safety meetings each Monday morning, at which the local shop or terminal supervisors review the performance for the past week and possibly describe in some detail the conditions leading up to specific accidents, has tended to revive and maintain interest in the important subject of safety.

The fact that long experience with repetitive operations involving some degree of danger may have a tendency to make shop men indifferent or careless was also referred to by this superintendent of motive power who writes as follows: "Some time ago, I made an analysis of our injuries according to the length of service of the employees and found that practically all of the injuries occurring were with employees of seven or more years' experience, indicating that, as the men become more accustomed to their work, they are inclined to be careless in handling it, and in my talk at various terminals on our railroad I have stressed that very point."

This statement illustrates only one of the many problems which aggressive safety committees at individual shops and terminals must keep constantly in mind and stress everlastingly if the desired results in accident prevention are to be obtained.

NEW BOOKS

AXLEBOXES AND RELATED PARTS, *Their Maintenance on Locomotives, Carriages and Wagons. By R. E. Brinkworth, A. M. I. Loco. E. Published by The Locomotive Publishing Co., Ltd., 3 Amen Corner, London, E. C. 4. 80 pages, 8½ in. by 11 in. Paper bound. Price, $1.50.*

This booklet, illustrated with drawings and sketches, sets forth the types of journal bearings, methods of spring suspension and wheels used on British locomotives and rolling stock. Its interest to the American reader lies in the extensive detail in which it goes into the performance and methods of service and maintenance of these parts according to British practice. Many details of construction and methods of lubrication which are foreign to American practice will be observed. There are seventeen chapters and an appendix. These deal with questions of lubrication and the treatment of hot boxes on the road, as well as the maintenance methods of dealing with each part.

HORSEPOWER OF LOCOMOTIVES—*Its Calculation and Measurement, By E. L. Diamond. Published by the Railway Gazette, 33 Tothill street, Westminster, S.W. 1, London, England. 24 pages, 9 in. by 12 in.; paper binding. Price 2s. 6d.*

This pamphlet is a reprint of a series of seven articles which appeared in the Railway Gazette in 1935. Starting with the early tests and deductions made by D. K. Clark, the author then takes up the work done by Prof. Goss, Von Borries and various investigators in America, England, Germany, France and other European countries. As test plant and road test data are the bases of our knowledge of locomotive horsepower —indicated, at rim of drivers and drawbar—consideration is given to such tests as those made by the Pennsylvania railroad and by other roads in Europe. In fact, the entire subject of locomotive testing is reviewed although somewhat briefly. The important formulas proposed by Cole and others are given, including the more recent formulas of Kiesel and Lipetz.

THE READER'S PAGE

Hiring and Firing Men

To the Editor:

On page 255 of the June issue of the *Railway Mechanical Engineer,* under the heading of "Firing Men," you publish a statement presumably written by a railroad official, reproducing a conversation with an applicant for employment.

I know the system of arbitrarily firing a man without a hearing still exists, but I still believe that each year there is an increase in the number of executives who are not too busy to give a discharged employee a hearing. If an official buys a piece of equipment or a machine and it does not come up to specifications, he will, in his report, elaborate on specific parts that are defective or inadequate; if the same official was compelled to give a similar report on the failure of his discharged employees and the discharged employees had the same opportunity as the machine or equipment builder to analyze the report, there would probably be fewer discharges.

The writer of "Firing Men" does not go far enough; there is a system in vogue at a goodly number of factories, also railroad shops, of hiring new men from the office. Foremen have often been called the key men of industry, and they are proverbially a good-natured bunch and are broad shouldered enough to take it going and coming. But it is always a puzzle to me how any office man or official can know just what kind of a man is best fitted for the particular work required. Who is the first to receive criticism when production slackens? Who knows first which man is unfitted for the job he is on?

Different jobs require different standards of physique and mental qualifications and it is usually up to the foreman to get 100 per cent production without a balanced staff, owing to a faulty system of hiring. I have seen 250-lb. men hired to run a small shop gasoline truck and 120-lb. men for blacksmiths' helpers.

Is it any wonder that the foreman occasionally gets out of hand and fires one of these misfits?

While I entirely agree with the writer of "Firing Men" in his system of personally interviewing every man fired, let him go one step further and allow his foreman to pass on every man hired, and I am convinced that his percentage of discharged employees would be still lower.

Foreman.

What a Car Foreman Is

To the Editor:

Here is an answer to the question, "What Is a Car Foreman?," which appeared among the Gleanings on page 313 of your July issue. (No doubt the writer of the paragraph is a car knocker, and perhaps it is not only cars that he knocks.)

Years ago, as I sat on a station platform, with a long freight train passing, I could hear one car approaching. It sounded as if there was a squealing hot box somewhere. Knowing that the train was made up only a few miles away, a hot box did not seem possible. As the car approached I managed to look under it and noticed that the flanges of the rear truck appeared to be trying to mount to the top of the rail. I raced ahead two or three cars and climbed up between them; by waving and shouting I attracted the attention of several other employees. They got the attention of the tower and the train was stopped.

A fast passenger train was due and after it had passed, the freight car was inspected. Nobody could see anything wrong with it, except one man, and he ordered the car out. As it was passing over a cross-over it toppled over onto the very rail that the passenger train had passed over only a few minutes before, blocking the tracks. All I want to say is, that the man who knew enough to cut the car out was a car foreman.

Observer.

What Is a Car Foreman?

To the Editor:

Referring to the item on the Gleanings page of your July issue, entitled, "What Is a Car Foreman?"

I became a car foreman in 1914, so that my experience in this department covers a period of 22 years. It is too bad that some of our shop foremen are not given an opportunity to come into more intimate contact with the outside car foremen. It would greatly enlighten them as to the duties, responsibilities and other trials which are an everyday occurrence in the life of the car foreman.

What are the car foreman's duties? He should have a thorough knowledge of car work. He should be able to handle mechanics and, if necessary, instruct them in the work which they are called upon to perform. He should be able to train young men to be good mechanics, imparting to them knowledge he has gained from actual work and experience. He must keep well posted on supervision, as well as on the short cuts in his work.

When a car or coach leaves the shop and is placed in service it becomes the responsibility of the car foreman and remains his responsibility until it ends up in the dismantling grave yard. Railroads may provide fine roadbeds, splendid motive power, high-class and expensive equipment, but it is the contents of the freight cars and the passengers in the coaches and other passenger equipment which bring in the revenues. The car foreman must keep the cars moving, whether it be a crack express train or the high-powered manifest. He and his helpers must be on the job, whether the weather be 40 below zero or 110 in the shade, rain or shine.

Mr. Backshop Foreman can sit in his comfortable home and enjoy everything that the railroad brings to his door. When he takes a trip over the railroad and rests comfortably in a Pullman sleeper, he will if he listens, hear the box covers being opened and closed, the tapping of the hammer on the wheels and the testing of the air brakes. The car foreman and his men are out there on the job, night and day, seeing that everything is O.K. and that the train gets to its destination safely.

The signing of the time cards by the car foreman is a very small item in his daily routine, but it gives him little time for relaxation, and "Goodness only knows" that is something he needs, especially when he has acted as a buffer or punching bag for the various officials, from the general superintendent down. His shoulders must be broad and strong to carry the many complaints that come from the A.A.R. inspectors, the head office time keeper, I.C.C. inspectors, the safety engineer, etc., and hard as he tries he cannot seem to satisfy them all.

Car Foreman.

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Car Shortage Threatened

Your basic thought in the page of your August issue, entitled, The Editor's Desk, is absolutely sound. It is my feeling that if it had not been for the drought there would have been an actual car shortage this fall. The railroads are certainly working very close to the line in connection with available car equipment.

New Machine Tools Needed

In the article on the Reading Locomotive Shop in your June issue, page 233, Table 1 shows the average age of machines retired to have been 34.8 years. The facts speak for themselves and bring us again to the point of looking up to the automobile industry which has always been ready to consider new machine tool equipment which can produce even a fraction of a second faster than they are now doing.

Railroad Worker Lucky

The railroad worker knows that our business has suffered severely throughout the depression, but any thoughtful, fairminded man is bound to admit that this great business is continuing to pay a relatively higher standard of wages than is being paid in industries in general for the same class of work. Make inquiries around town about wages and working hours in any of the industrial plants and the comparison will be calculated to make you think yourself lucky.

The Grouch

Recently I had a nice visit with the shop superintendent of a large industrial plant. We got to talking about the great changes in the relationships between management and men which are taking place in the more successful plants. This is what he told me:

"I had a little run-in with Friend Wife a while ago in trying to tell her how she could improve upon her kitchen management. She got plenty sore and told me she had heard that I spent my time in the factory finding fault and looking for nothing but defects, shortcomings and other irregularities—that I was oblivious to things that might be well worth commending. She went on to say that in consequence of living in such a faultfinding atmosphere I was becoming a grouch at home, too. She suggested that I should get wise to myself or I would not have a friend left in the whole works.

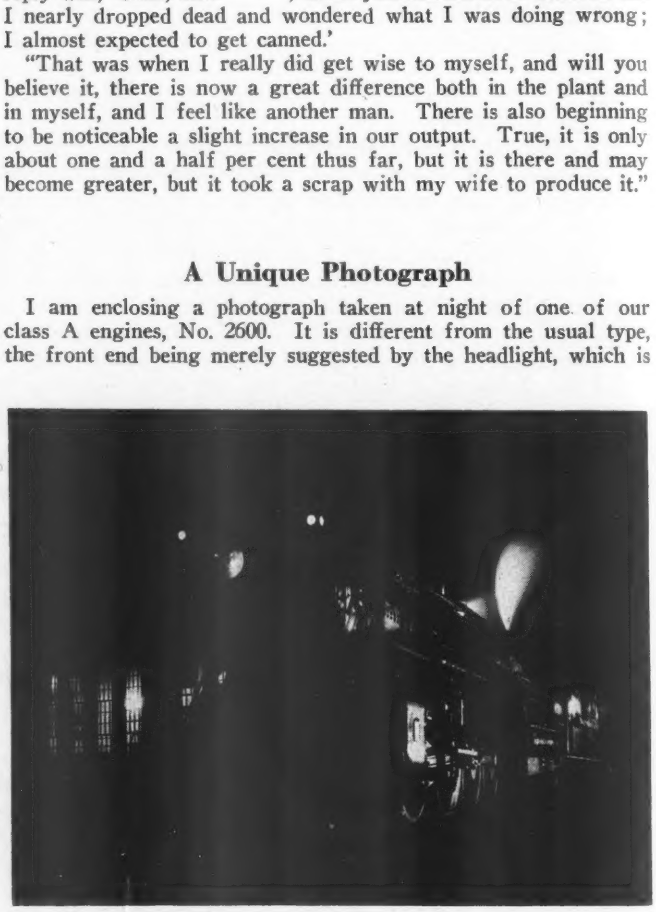
"Now the 'heck' of this was that to some extent she was quite right about seeing only the faults, because that is all I had been looking for, or was particularly interested in.

"Well, I decided I would try looking for praiseworthy things and soon found something well worth special notice. I called the foreman of the department—he was not looking any too happy—and told him how pleased I was to note so and so. The poor fellow became so embarrassed that it affected me somewhat as well. To tell the truth, he almost fainted. So I passed on down through the shop. Stopping at a lathe I told the machinist that he was taking a nice cut and commented on how well his tool was ground to peel off the metal in such a way. Then I went on to tell him how years ago I had run a big lathe. The reply was, 'Gosh, Mr. ———, when you started over towards me I nearly dropped dead and wondered what I was doing wrong; I almost expected to get canned.'

"That was when I really did get wise to myself, and will you believe it, there is now a great difference both in the plant and in myself, and I feel like another man. There is also beginning to be noticeable a slight increase in our output. True, it is only about one and a half per cent thus far, but it is there and may become greater, but it took a scrap with my wife to produce it."

A Unique Photograph

I am enclosing a photograph taken at night of one of our class A engines, No. 2600. It is different from the usual type, the front end being merely suggested by the headlight, which is



dimmed, and the running lights. This engine was ready at the time, to pull No. 3, one of our coach trains.—*George W. McElhinny, machinist apprentice, Northern Pacific, St. Paul, Minn.*

Who Was at Fault?

With the improvement in business and readjustments which we have had to make in our shop supervision, it has been necessary to promote some of the younger men. Perhaps it is the management's fault, which means in this case the shop superintendent, that the following incident occurred.

A young machinist was appointed to a minor supervisory position. Two weeks later the general foreman met him in the shop and commented on the fact that he had frequently noticed a certain one of his men in various places about the shop and apparently for no particular reason. He asked the young supervisor to look into it. That evening, after quitting time, the worker came to the general foreman and said:

"I understand you think I spend considerable time loafing about the shop."

"What makes you think so?" asked the G. F.

"My foreman told me so. He said that you had been after him about it and that I had better keep my eyes open or something might happen. I wish you had told me yourself when you saw me where you thought I ought not to have been. I am always able to give a good account of myself and I think I could have satisfied you that I was not loafing."

Just who was to blame for this sort of thing happening?

With the Car Foremen and Inspectors

Checking V-Belt Length

A machine for checking the length and testing the strength of endless V-belts is shown in the illustration. Where two or more V-belts are used together, they must be of the same length and have an equal tension or one belt will carry all the load and wear out unduly fast. When one belt of a set breaks, a new set of belts is applied and the serviceable old belts allowed to accumulate until a supply is collected. They are then matched in sets for length and stretched by use of the device shown. Excessive wear on the belt is determined by looking in a hole bored in the bottom pulley and noting how close the belt is to the bottom of V-groove. Belts that come to less than 1/16 in. of bottoming in the groove should be discarded.

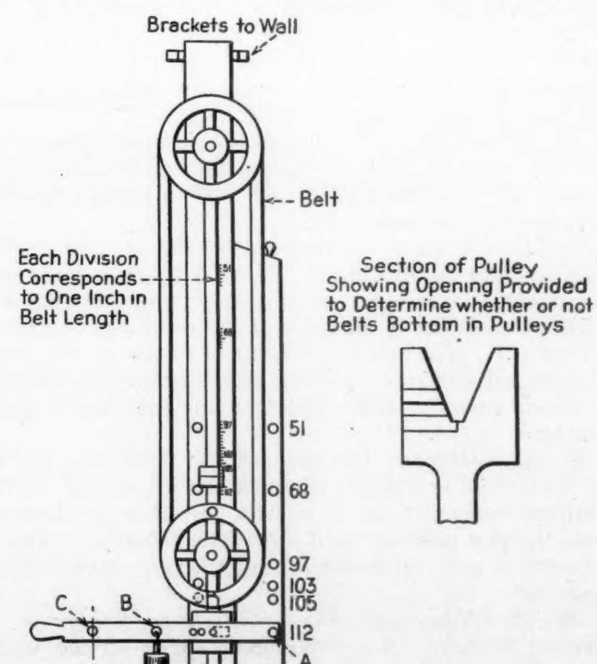
Belts tested with this device include the 1/2-in., 21/32-

Weight for stretching the belt under tension while measuring

in. and 3/4-in. endless V-belts of axle-driven generators for car-lighting or air-conditioning equipment. The testing device is secured by brackets to any convenient wall in the car shop or inspection shed. The endless V-belt is applied over two pulleys, as shown, the belt length being indicated by graduations on the sliding scale. A horizontal hand-lever pivoted at *A* exerts a downward pull on the belt by means of a weight suspended at points *B* or *C*. The particular pivot-pin hole selected will depend upon the length of the belt being tested which, in the instance illustrated, is a 112-in. belt. A 50-lb. weight is suspended from hole *B* for testing 21/32-in. section belts and at hole *C* for testing 3/4-in. section belts. A 25-lb. weight is used in hole *B* while testing 1/2-in. section belts.

In order to adjust the machine to measure the length of a belt, the weight is removed from the lever, the lever moved to the horizontal position and held in this position, with the lever-locking pin inserted through the holes in the lever and the 3/4-in. brass block behind the lever. The pivot pin can then be removed from the right-hand hole in the lever, and the sliding mechanism, of which the lower pulley is a part, can be moved to the proper position in the slot when the lever pivot pin can be inserted. The lever-locking pin can then be removed and the lever raised up until the lever-locking pin can be inserted in one of the large holes in the lever and brass block, and a small hole in the channel iron.

The next step is to apply the proper size weight in the proper hole in this lever; then place the belt to be measured in the pulleys. Relieve the weight on the lever-locking pin by slightly raising the lever, remove the lever-locking pin and gradually allow the lever and weight to lower until the full weight is on the belt. Then rotate the lower pulley by the handle about six times and note the length. Also, it must be noted whether or not the belt sets too low in the pulley grooves. This can be determined by observation through the slot cut in the bottom pulley when the slot is in the down position and the handle up. If it is a serviceable belt, a small white



Arrangement of pulleys and weighted lever for testing V-belt lengths

tag can be attached showing its correct length, and permitting it to be later matched according to the length marked.

In removing a belt from the machine, the lever should be raised and the lever-locking pin inserted in the three holes in the lever, brass block and channel iron, with the lever above the horizontal position.

Each graduation on either side of zero on the sliding scale represents 1/8 in. belt length and each division on the fixed scale represents 1 in. length. No attempt to adjust the sliding mechanism should be made with the weight attached to the lever arm, or belts allowed to remain in the machine under tension over night or at any other time than when it is actually desired to measure them. The weights should also be removed when the machine is not in use.

Manufacturers furnish new belts in matched length sets, and if desired, a check can be made of this feature by measuring new belts in stock at the particular yards where these devices are located.

Questions and Answers On the AB Brake

30—*Q.—What is the duty of the service graduating valve?* A.—Opens and closes passage between: (1) auxiliary and emergency reservoirs with the slide valve in release position. (2) brake pipe and quick service volume with the slide valve in full release position. (3) auxiliary reservoir and brake cylinder with the slide valve in service position.

31—*Q.—What is the duty of the release insuring valve?* A.—To insure return of the service piston to release position in case of excessive slide-valve friction, by exhausting auxiliary-reservoir pressure to the atmosphere.

32—*Q.—What is the duty of the limiting valve?* A.—To terminate secondary quick service when a predetermined brake-cylinder pressure is developed.

33—*Q.—What is the duty of the back-flow check valve?* A.—To prevent flow of brake-cylinder pressure into the brake pipe, such as during emergency, when that pressure is higher than the brake pipe.

34—*Q.—What is the duty of the duplex release valve?* A.—To reduce (manually) auxiliary-reservoir pressure alone, or emergency-reservoir and auxiliary-reservoir pressures at the same time.

35—*Q.—What is the duty of the release and application by-pass check valve?* A.—To by-pass brake-pipe air around the strainer in case of strainer restriction.

36—*Q.—What is the duty of the service-piston return spring?* A.—To prevent movement of the service piston to retarded recharge position, unless brake-pipe pressure is about three pounds higher than auxiliary-reservoir pressure.

37—*Q.—What is the duty of the stabilizing spring?* A.—To provide stability of quick-service activity by preventing movement of the service piston to preliminary-quick-service position until a predetermined difference in pressure is attained between the brake pipe and auxiliary reservoir.

38—*Q.—Name and locate the choke fittings in the service portion.* A.—Preliminary-quick-service choke, located in the body under the release-insuring cover. Quick-service choke, under the limiting-valve cover, and release-insuring choke, in the release-insuring cover.

39—*Q.—What is the size of the opening in the preliminary quick-service choke, and what does it control?* A.—1/32-in. opening. Restricts the flow of air from the quick-service volume to the atmosphere and provides the secondary quick-service function.

40—*Q.—What opening has the quick-service choke, and what does it control?* A.—1/32-in. opening. Restricts the flow of air in the quick-service passage between the slide and limiting valves.

41—*Q.—What is the size of the opening in the release-insuring choke, and what does it control?* A.—1/32-in. opening. Controls the flow of air in the passage between the release-insuring valve and slide-valve exhaust in service-lap position.

42—*Q.—What volume is incorporated in the service portion, and what is its purpose?* A.—The quick-service volume, into which the brake-pipe pressure flows, to initiate preliminary quick-service.

43—*Q.—To what is the volume at all times connected?* A.—To the atmosphere, through the preliminary quick-service choke plug.

44.—*Q.—How many springs are contained in the service portion?* A.—Twelve springs.

45—*Q.—Name them.* A.—(1) Graduating-valve spring. (2) Slide-valve spring. (3) Piston spring. (4) Return spring. (5-6) By-pass check-valve springs (2). (7) Diaphragm spring. (8) Limiting and back-flow check-valve spring. (9) Duplex release-valve plunger spring. (10-11) Release check-valve springs (2). (12) Release-insuring-valve spring.

46—*Q.—It being understood that the valve springs are for the purpose of holding the various valves to their seats, what are the duties of the other springs mentioned?* A.—Piston spring resists the movement of piston and graduating valve after the feed grooves are closed, and just previous to opening of the preliminary quick-service port. Return spring returns piston and slide valve from retarded re-charge to normal re-charge position. Diaphragm spring acts on the diaphragm of the quick-service limiting valve to hold it open until the force of the spring is balanced by a cylinder pressure of 10 lb. Release-insuring valve spring holds this valve on its seat until brake pipe pressure rises 1½ lb. above auxiliary reservoir pressure.

Emergency Portion

47—*Q.—Name the operative parts of the emergency portion.* A.—(1) Emergency piston. (2) Emergency slide valve. (3) Emergency graduating valve. (4) Vent valve and piston. (5) Accelerated-release piston. (6) Spill-over check. (7) Ball check. (8) Accelerated-release check valve and ball check. (9) Inshot piston. (10) Inshot valve. (11) Timing valve.

48—*Q.—What is the duty of the emergency piston?* A.—Acts as a dividing line between brake pipe and quick-action chamber and operates the emergency slide and graduating valves.

49—*Q.—What is the duty of the emergency slide valve?* A.—Controls the flow of air from: (a) Quick-action chamber via graduating valve to atmosphere during service applications. (b) Quick-action chamber to vent-valve piston in emergency. (c) Quick-action chamber to outer face of accelerated-release piston, except in emergency. (d) Emergency reservoir to outer face of accelerated-release piston during emergency. (e) Emergency reservoir to brake cylinder in emergency. (f) Brake cylinder to brake pipe (via checks 93 and 94 during release after emergency). (g) Brake cylinder to outer face of inshot piston (through inshot volume), except during emergency.

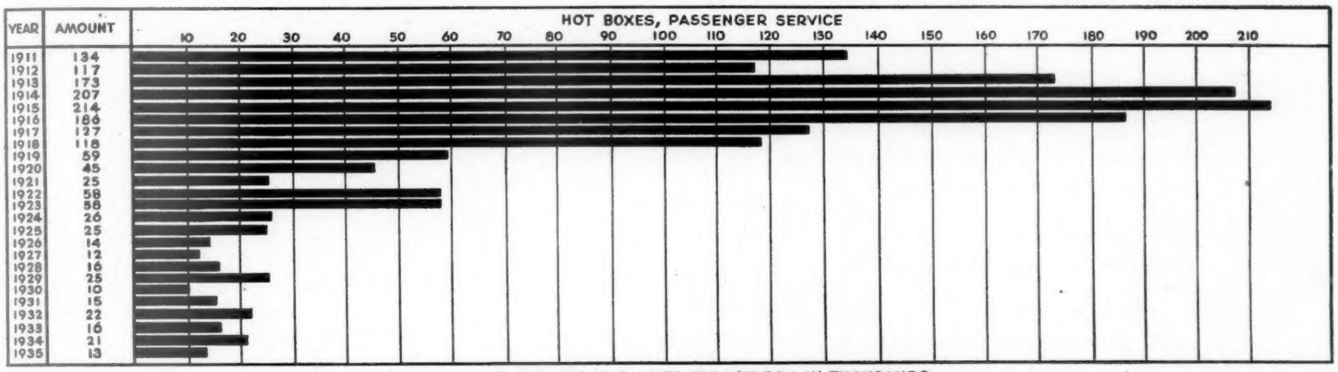
50—*Q.—What is the duty of the emergency graduating valve?* A.—Controls the flow of air from: (a) Quick-action chamber to atmosphere during service applications. (b) Quick-action chamber to vent-valve piston during emergency applications.

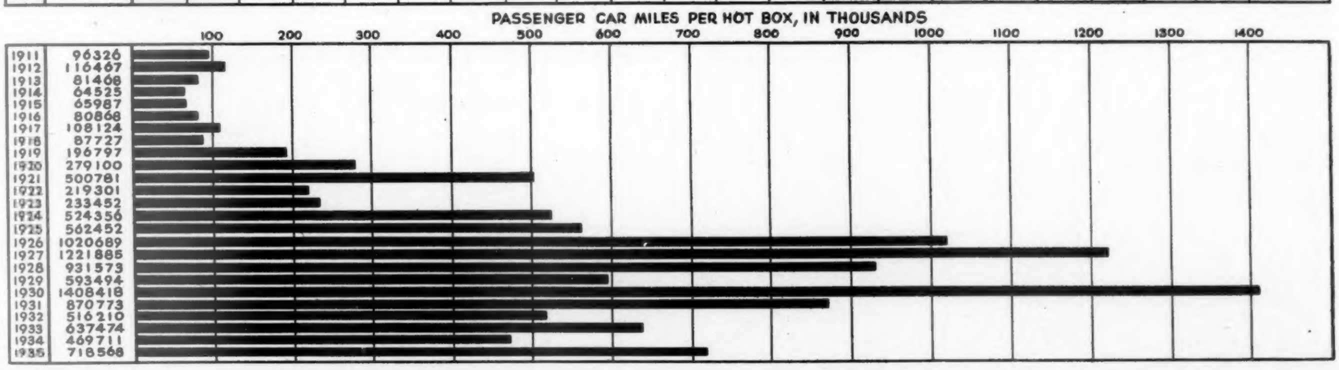
What Has Happened To the Hot Box

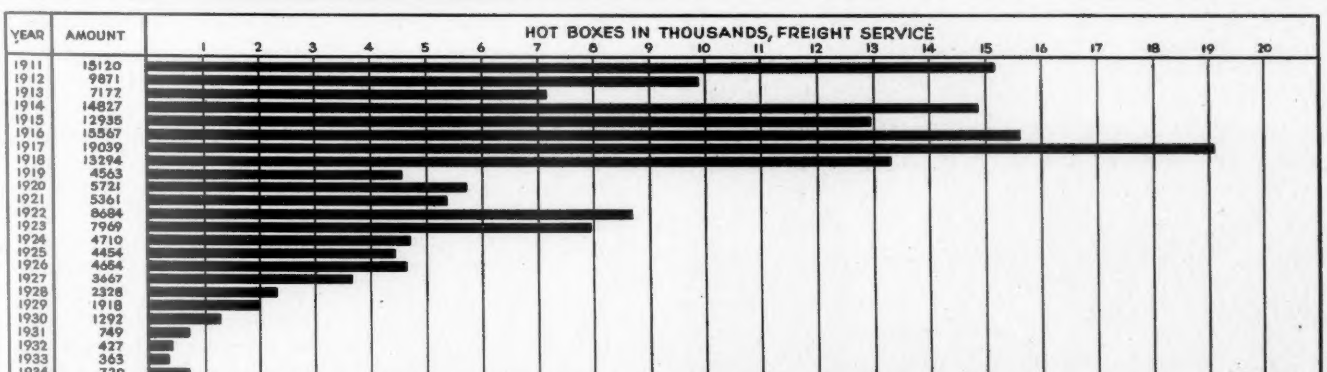
The accompanying charts, reproduced from the May 1, 1936, issue of the Delaware & Hudson Bulletin, tell their own story of the improvement which has taken place during the last quarter century in one important phase of railway operation on this railroad. The marked improvement which has taken place since 1927 is attributed to three remedial measures: The use of materials (oil and waste) of proper quality; the adoption of a satisfactory system of caring for journal boxes and contained parts, and the correction of improper truck details, such as springs.

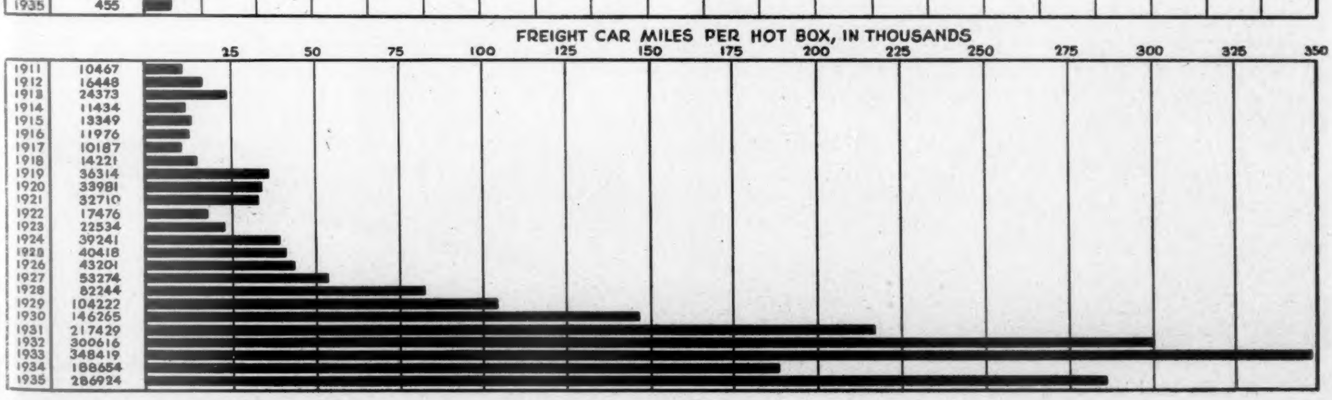
A.A.R. Rule 66, adopted March 1, 1929, has been a factor in reducing hot-box trouble on all railroads. A system of education in effect on the D. & H. insures that all supervisors and subordinates who have anything to do with journal-box and wheel maintenance are properly instructed. Periodic checks determine whether such matters are being given uniformly correct handling at all points.

During the period reported no change has taken place in the definition of a hot box, although the count of train delays on account of hot boxes is said to be more strict in recent years than during the earlier part of the period covered by the record. While the record covers the D. & H. only, it may be considered as typical of the results obtained where close and systematic attention









has been given to the three important items listed above—the use of proper materials; careful and systematic attention to journal boxes, and the correction of truck details affecting journal-box performance.

Reaming Device for Brake Beam Heads

*By A. Skinner**

To conform to a recent ruling that all tension rods for brake beams be changed from 1¼ in. to 1⅜ in. when brake beams are sent in for repairs, it is found necessary to ream or drill out the heads to accommodate the larger rods. Since the tension rod hole must be at an angle of 25 deg. with the channel bearing surface, it assists greatly in the drilling operation if the jig can be used to hold the brake head at such an angle on the drill table that the hole will be vertical.

A jig, designed for this purpose, is shown both separately and with the brake head applied, in the illustrations. It consists of a steel base plate ⅝ in. thick, by 4 in. wide, by 16 in. long, to which is welded a steel block chamfered on the bottom to an angle of 25 deg., and having a U-shape steel back piece welded to the top in such a way that the brake head can be fitted over it with no clamps necessary to hold the head during the drilling or reaming operation. This U-back was cut from an old back taken from a scrap brake beam.

The jig is secured to the drill table by means of two bolts and when the brake head is applied the truss-rod hole is vertical and can be drilled or reamed with the assurance that the hole will have the proper angle. The

The brake head drilling jig set up on the drill table

use of this jig assures a uniformly accurate drilling operation, and owing to the ease of setup and the elimination of time required for applying and removing clamps, the production is greatly increased.

* General foreman, Atchison, Topeka & Santa Fe reclamation plant, Corwith (Chicago), Ill.

A brake head on the jig ready for the drilling operation

Hamerench for Applying And Removing Nuts

A pneumatic tool which combines the actions of a hammer and a wrench in a distinctly new principle of operation is now being introduced by the Independent Pneumatic Tool Company, Chicago. This new tool, known as the Thor No. 603 Hamerench, is designed to apply and remove all types of nuts, staybolt caps, etc. in locomotive repair work and also be adaptable to the extensive nut running and removing operations in railroad car shops, enginehouses, etc.

Made of alloy steel throughout, and with parts proportioned so as to avoid overstress and consequent possibility of failure at any point, the Hamerench construction is notable for simplicity and ruggedness. The ratchet collar, shown in detail in one of the illustrations, receives its motion from a piston in the hardened steel pneumatic hammer barrel, and it, in turn, actuates a spindle which drives the socket. Nuts and flexible caps are applied and removed by perfectly timed impacts, 1,800 to the minute, with no backup of the ratchet collar possible owing to the pawl action. All torsion developed by each impact is absorbed in the tool, providing maximum safety to the operator. In fact, the tool can easily be worked with one hand, the speed and power of the blows being controlled by the operation of a self-closing hand throttle. Changing the socket

General view of the Thor Hamerench used in applying and removing nuts

from one end of the spindle to the other makes the tool reversible. The right-angle type construction of the tool permits operating it in places inaccessible to other types of machines designed for a similar purpose. The tool can be used with very little strain or fatigue, regardless of the position of the nut which is being applied or removed.

In designing the ratchet collar of the Hamerench, the distribution of the impact is controlled by a unique arrangement of the teeth. All parts of the Hamerench which have threaded connections utilize a new form of construction providing 50 per cent increased strength. The wrench is so designed that all moving parts are readily accessible for inspection or replacement, if necessary. There are no gears in this new tool. Lack of vibration in operation protects the square socket hole which does not become rounded and thus lessen its effectiveness as well as having a tendency to cause rounded nut corners.

The Thor No. 603 Hamerench is designed for use with all sizes of nuts up to 1⅛ in., although under ordinary conditions even larger sizes can be accommodated. The sensitive response of the wrench to the hand throttle enables the operator to avoid breakage and stripping of threads on smaller bolts. Extension adapters are available for use in awkward places which could not otherwise be reached.

Milwaukee Double-Deck Wheel Cars

For several years, the Chicago, Milwaukee, St. Paul & Pacific has been handling car wheels to and from the main car wheel shop at Milwaukee, Wis., on special double deck wheel cars which were first described in the *Railway Mechanical Engineer* of February, 1932. One of these cars, equipped with 20-in. I-beams, having alternate staggered openings to accommodate the mounted car wheels, is illustrated. Another car, equipped with an earlier type of double deck loading arrangement, is shown in the second illustration.

The extensive use of these type of cars, adapted to double deck loading, is predicated upon the fact that only one-third of the number of cars needed for handling wheels is required, as would be the case with single deck loading. In the case of the Milwaukee, which formerly used about 7,700 cars per year for handling mounted wheels, this means a reduction to 2,570 cars. Moreover, an additional saving of $2.81 per load is effected due to the fact that the wheels do not have to be blocked. There is also a large saving in decking which is usually badly damaged or worn out after one or two trips with a double-deck load of car wheels on conventional flat cars or gondolas.

One of the earlier types of double-deck car-wheel-loading devices used on the Milwaukee

Flat car arranged for double-deck wheel loading at Milwaukee shops

IN THE BACK SHOP AND ENGINEHOUSE

Treating Railway Water

*By R. E. Coughlan**

Practically all of the railroads operating steam boilers have, from time to time, experienced trouble due to leaking boilers, waste of fuel and various operating delays on account of unsuitable water. This is due to the fact that natural water obtained from wells, streams, lakes, etc., is never chemically pure. A chemically pure water is only obtained by the condensation of steam in a closed vessel.

The common source of supply of water originates with rainfall, at which time the water passing through the air absorbs the gas known as carbonic acid. After reaching the earth, the water, as it seeps away into the ground, dissolves various mineral salts from the soil. It is these mineral salts dissolved which give to the water what is commonly known as the hardness. These mineral salts usually found dissolved in practically all natural waters are the various salts of lime and magnesia. The most common of these which the railroads encounter in water supplies are principally the following: Calcium carbonate (chalk), magnesium carbonate (talc), calcium sulphate (gypsum) and magnesium sulphate (epsom salts). In

Exterior of 35,000-gal. per hr., continuous type, lime, soda ash and sodium aluminate water softening plant at Butler, Wis.

addition to these four, most waters contain some silica and small amounts of the salts of iron.

It is the duty of the railroad water service engineer to obtain, if possible, the best water available on the various districts of the railroad, which water will contain the least amount of the mineral salts responsible for hardness. As this on most railroads is a physical impossibility, the most economical method of supplying a suitable water for locomotive use is by softening the available water.

The chalk and talc are often referred to as temporary hardness, because of the fact that heat alone will remove the greater percentage of these mineral salts. Heat drives off the carbonic acid gas which in turn is responsible for keeping the chalk and talc dissolved in the water. The gypsum and epsom salts can only be removed by complete evaporation or by chemical treatment. The most common chemical used for this purpose is carbonate of soda, known as soda ash. This chemical changes the sulphate of lime and magnesia to sulphate of soda, commonly known as glauber salts, which material will remain dissolved in the water and will not

Complete lime, soda ash and sodium aluminate water treating plant, capacity of 12,500 gal. per hr., continuous type, at Scribner, Nebr.

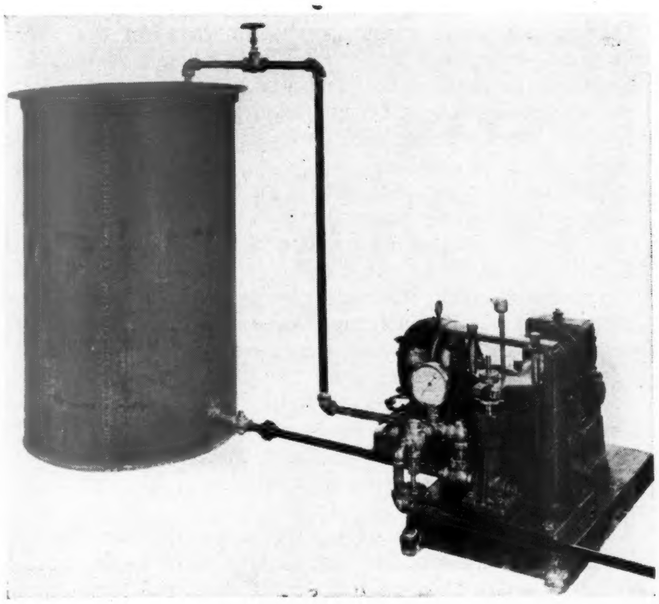
cause any hardness. Insoluble chalk and talc, which settle out of the water, are also formed by this treatment. The chalk and talc found normally in water are usually removed by the addition of a strong solution of lime water (calcium hydrate) or caustic soda which absorbs the carbonic acid gas, after which the chalk and talc settle out of the water on standing.

In a modern water softening plant, the soda ash and lime water are added simultaneously in direct proportion to the amount of mineral salts dissolved in the water, as shown by a chemical analysis of the natural water which is to be softened. The softened water, or, as it is commonly known in railroad service, treated water, contains in solution the glauber salts and a small percentage of the original chalk and talc, plus a slight amount of lime water and soda ash.

When water is softened and its original content of mineral salts removed or changed, its behavior when used

Interior view of water, softening plant at Butler, Wis.

* Supervisor of Water Supply, Chicago & North Western, Chicago.

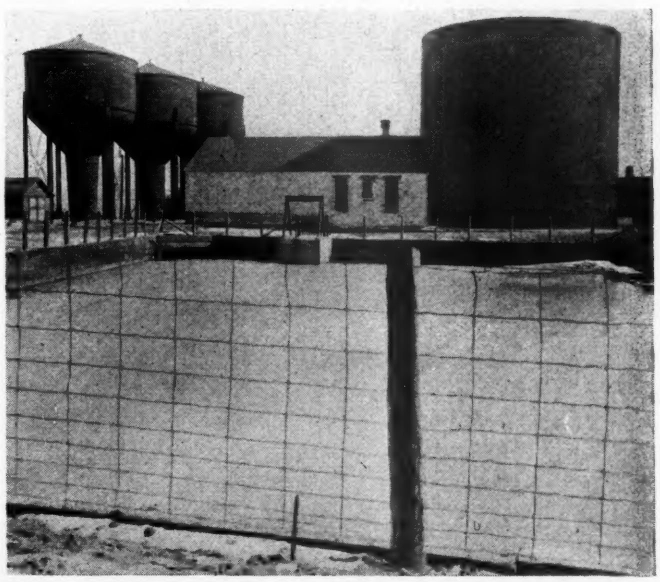


Type of equipment installed in a wayside sodium-aluminate treating plant

for the generation of steam also changes. When large amounts of chemicals must be used, the treated water is sometimes referred to as light. This means that the softened water, having in solution large amounts of sulphate of soda (glauber salts) in addition to a slight excess of the chemicals used in the treatment, has a tendency to build up bubbles on the surface of the water in a boiler, which, in turn, retards the free and rapid escape of the steam so that sometimes water is carried out of the boiler in small drops with the steam. This is known as foaming. This is aggravated by the presence of suspended matter in the water. This trouble is somewhat different from that which is known as priming, although both foaming and priming are often referred to as the same trouble. Priming consists of water suddenly leaving the boiler with the steam in comparatively large amounts, due to the nature of the chemical salts in solution, suspended matter, operating the boiler beyond capacity, sudden opening of the throttle, restricted steam space, or a combination of two or more of these causes.

The amount of the mineral salts changed over to the soluble form in a softening plant accumulates in the boiler upon continual evaporation of additional water. The amount of such salts sometimes increases to such quantity that foaming occurs, unless these mineral salts are reduced by means of the blow-off cocks. Blowing out the boiler usually reduces such concentrations to a satisfactory operating amount. The increased cost of this blowing out, with its attendant loss of water and steam, is more than offset by the improved operating condition of the boiler and its long life, due to its general cleanliness. When the total concentrations become so high that the blowing out of the boiler cannot keep these concentrations reduced to a satisfactory operating degree, it has been found that anti-foam boiler compound will be of great help in operating with these higher concentrations. The best of these anti-foam compounds contain approximately 15 per cent of vegetable castor oil emulsified with tannin extract or similar material.

It has sometimes been found that with water partially treated or containing large amounts of temporary hardness, unless all of this hardness is removed, trouble is experienced with the brass fittings, boiler checks, feed pipes, cab fittings, etc., due to the accumulation of the temporary hardness which adheres to these fittings. This necessitates frequent cleaning of such fittings, or complete treatment, followed by the use of such material as tannin extract, sodium aluminate or similar material, to eliminate this trouble.



Reservoir, softening tank, and three softened water storage tanks at Proviso, Ill. Capacity of plant 100,000 gal. per hr., continuous type, lime, soda ash and sodium aluminate treatment

Interior of 100,000 gal.-per-hr. complete lime, soda ash and sodium aluminate water softening plant at Clinton, Iowa. In this plant, all facilities are started and stopped by means of automatic electric control

In addition to the operation of lime and soda ash complete water softening plants, many of the railroads today have found it to be a decidedly profitable investment to use wayside methods of water treatment, and, also, various boiler compounds.

In the wayside method of treatment, no additional settling tanks or treating tanks are necessary. Such chemicals as sodium aluminate, caustic soda, tannin extract, soda ash and the various forms of sodium phosphate are fed directly into the wayside storage tank by means of small automatic feeding devices which proportion to the water the exact amount of treatment required to neutralize the scale foaming salts in the water. The chemical reactions in this method of treatment are completed in the locomotive boiler; and by means of intelligent methods in keeping the boiler concentrations re-

(*Continued on page 413*)

MOTOR CARS Are So Costly

"But we don't want any motor cars on the Plains Division—they're always giving trouble. We used to have one running out of Sanford. When it wasn't tied up for repairs it was being pulled in with a locomotive," H. H. Carter, master mechanic of the Plains Division of the S. P. & W. argued.

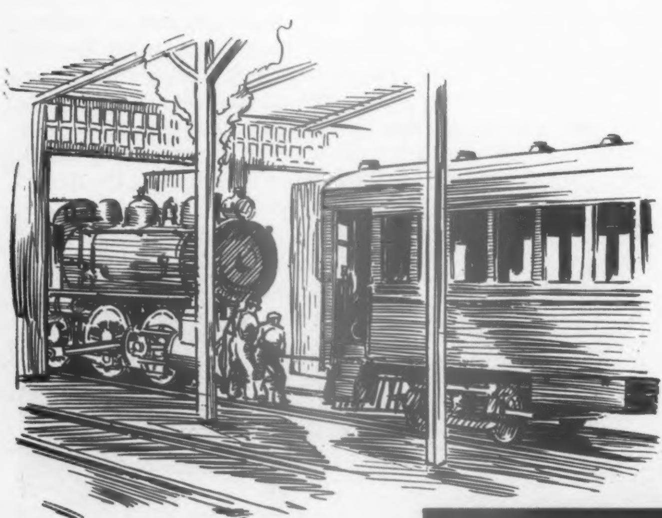
"That's true, you did have a lot of trouble," the superintendent of motive power agreed, "but they're being run successfully on other divisions and there's no reason why it can't be done on the Plains Division. At any rate, you're getting one next week for the local run between Plainville and Sanford, and you might as well make up your mind to like it—and to keep it running!" the S. M. P. added.

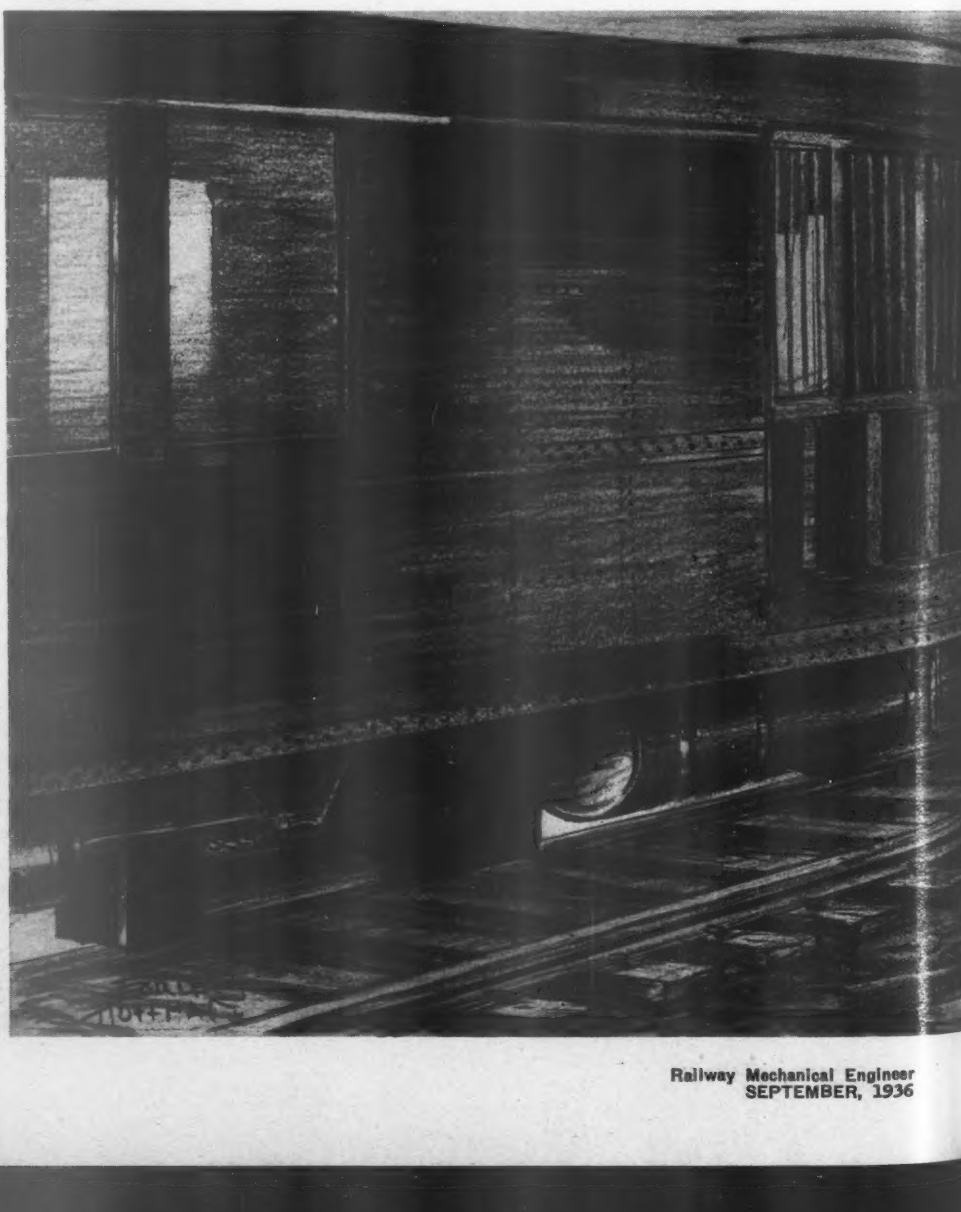
"O. K." The master mechanic forced a smile. "But I'm afraid we'll find it more expensive to operate than a steam train. We'll do our best, though," Carter added when he noticed the lines around the S. M. P.'s mouth tighten.

The superintendent of motive power left on No. 10. After the Limited pulled out, Carter went to the roundhouse to break the news to Jim Evans, the roundhouse foreman. Evans liked motor cars about as well as the master mechanic, which was not at all.

Evans was in the roundhouse office trying to figure how to stay within his allowance and still keep the engines running when Carter came in.

"Getting a motor car next week," Carter announced as though it was the best news in the world.





The motor car arrived Sunday afternoon. Ray Anderson, traveling motor-car supervisor, was with it. Evans was waiting by the office

"What!" Evans forgot to close his mouth until tobacco juice running out the corner reminded him that it was open.

"Yeah, we're getting a motor car for the local run between here and Sanford."

Evans spat and bit off a hunk of "horseshoe." "Why, dammit, we had a motor car on that run once and it was always giving trouble! It made the failure sheet look like a football score. Run up M. of E. costs, too!"

"Yeah, I remember, but they're running them successfully on other divisions and there's no reason why we can't do it here. You might as well make up your mind you're going to do it and like it." The master mechanic quoted what he had heard about an hour before.

"Who you got to put on as maintainer? We'll need a good man."

"Well, to tell the truth we don't have any one. Martin is the only man we have that is qualified on motor cars but he won't bid on the job. He's on the lead job in the machine shop. He'd be a good man if he'd take it," Evans added.

"Get him on it if you can. Better get a bulletin posted on the job today," Carter said and left Evans alone with his worries.

There were no bids for the job maintaining the motor car. Evans tried to persuade Martin to bid on it, but the machinist couldn't see it that way. Less grief and more money on the job he had. Baker, the youngest machinist in seniority, was forced on the job.

by
Walt Wyre

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"Well, anyway, I'm glad to get Baker off the drop-pit. He does just enough to keep from getting fired and little enough that every engine coming off the drop-pit is delayed," Evans commented when the time had expired on the bulletin with no bids.

THE motor car arrived Sunday afternoon. Ray Anderson, traveling motor car supervisor, was with it. Anderson ran the car to the roundhouse. Evans was waiting by the office.

"What engineer is getting the motor car?" Anderson asked.

"Looks like now it'll be Stewart. He's the only man bidding on it. It's either that or the extra-board," Evans added.

"Don't seem to remember him. Is he qualified on motor cars?"

Evans bit off a hunk of horseshoe. "I don't think so."

Anderson groaned. "Next thing I guess you'll be telling me that I'm getting a green maintainer."

Evans spat reflectively. "You're right, first guess."

Anderson groaned again, louder than before. "I can see where I have a nice vacation—riding the car all day, then working all night. It's a great life! Maybe some

of these days motor car maintainers will be in a separate craft altogether. But guess it's too much to hope for." Anderson shrugged his shoulders and walked over to the office to send a message notifying the superintendent of motive power of his arrival in Plainville.

"What kind of engineer is Stewart?" Anderson asked John Harris, the clerk.

"Oh, he's all right, I guess. He took the examination three times before he was promoted," the clerk replied.

"Damn!" Anderson exploded, "and they complain of motor cars giving trouble! It's a wonder they do as well as they do. Of course we've got good men on them at some points, maintainers and engineers too, and they don't give trouble, either," the supervisor said.

The motor car maintainer came to work at eight o'clock. Anderson stayed with him until midnight and did practically all the work. Baker broke the porcelain of four spark plugs taking them out to clean them.

Anderson was up at six o'clock next morning. He wanted to look the car over before time for it to start out on the run at 7:45. He reached the roundhouse a little before 7 o'clock. The car was still in the stall. The hostler and his helper were fixing to get the car out of the house by pulling it with a cable attached to the switch engine when Anderson got there.

"What's the big idea?" Anderson asked. "Won't it run?"

"Don't know," the hostler replied. "I never run one of them."

Anderson climbed up in the car and started the number two motor, that is, he turned on the ignition and pushed the starting switch. The engine popped and sputtered, kicked over a few times and died. He pressed the starting switch again. There was a loud explosion in the exhaust.

Anderson shut off the ignition and went back to look at the engine. "Well, I'll be damned!" he exclaimed.

"What's the matter? Something wrong?" Evans had climbed up in the car to see why the delay getting out.

"Why, the blasted dumb-bell has got the spark plug wires all crossed up. He must have pulled them out of the distributor, then put them back without paying any attention to firing order or anything else." Anderson was busy straightening out the wires as he spoke.

The car got out thirty minutes late the first day but with the supervisor at the throttle reached Sanford on time.

ANDERSON put in the next six days and most of the nights with the motor car. He got so far behind with his sleep that he could go to sleep standing up like a horse. By the end of the week he was planning to take his vacation, if and when he got one, at the North Pole and sleep from sunset to sunrise.

Saturday morning Anderson received a wire to go to another division to break in a maintainer. Stewart took the car out alone for the first time. A steam locomotive brought the train in that evening. The engineer made a flag stop at Guys, eleven miles out of Sanford. When the conductor gave the highball, Stewart started the car with the controller handle in parallel position and with the brakes set.

There was a muffled thump-thump under the car. Too late Stewart closed the throttle. Two motors had flashed over. Number one motor melted two brush holder leads completely through and the commutator looked like it had been in a fire. Number two motor wasn't so bad, but the commutator needed dressing and one brush holder was damaged beyond repair. After thirty minutes delay, Stewart figured out how to cut out the damaged motors as he had been instructed and the car limped into Sanford.

Anderson got back to Plainville Sunday night. Machinist Martin was called in to help on the car Sunday night, at time-and-a-half. The car was ready to go out on the run next morning at schedule time. Anderson went along after having had three hours sleep and breakfast of two cups of black coffee and an aspirin.

Thursday, Anderson received a wire from the superintendent of motive power wanting to know if the motor car supervisor had located permanently in Plainville.

Neither the maintainer nor the engineer could be called qualified for their jobs on the motor car. In fact, neither of them was particularly interested in their job and, no matter how much time they put in on it, would ever be really good. Anderson knew that, yet if he disqualified either or both, others perhaps no better would be forced on the job and he'd have to start all over again. Saturday he pronounced both men qualified for their jobs and left the motor car with them. He salved his conscience with the thought that at least they were probably as good as they'd ever be.

Some men work better without supervision, needing only the incentive of a job to be done to stimulate their best efforts. Other men of less initiative become lax when left to their devices.

Baker was of the latter and larger class. Not exactly lazy nor indolent, but just a little careless and with a tendency to drag unless prodded occasionally.

After Anderson left, the motor car maintainer and his helper were left severely alone with no one to suggest that if certain things were done in time future trouble might be avoided. Bob Parker, the night foreman, seldom went near the motor car. If they had trouble with it, as he expected, he wanted to be out from under the responsibility of having anything to do with it. Evans saw the car only as it left each morning.

The car went along fairly well a few days following the departure of the supervisor. The car was in pretty good shape and only routine maintenance was required to keep it running. Baker's helper attended to changing the lubricating oil, filling the radiator, and servicing the car in general. The maintainer puttered around, mostly interested in getting in eight hours each night with as little inconvenience to himself as possible. His motto was that the car made one trip all right, it ought to make another.

The theory might be good but it didn't work so well in practice. Deferred maintenance like borrowed money accumulates interest and the motor car was no exception. Bearings became worn, allowing the oil pressure to drop. Rings became worn, causing the engines to lose power. The engineer didn't know what the trouble was. All he knew was that he had to work the engines harder to make the time and in many cases didn't make it then. If he had a couple of extra stops to make or was delayed a few minutes sawing by a freight, it was impossible to make up the lost time.

"Don't you think we'd better take up the bearings on the number two engine?" the maintainer's helper suggested one night. "They're pretty loose," he added.

Baker looked them over and decided that the helper was right. "We'll tighten a couple of them tonight and get the others tomorrow." He took a couple of shims out of the bearings. They still seemed a trifle loose and he took out two more and drew the nuts up tight.

"Pretty tight, ain't they?" the helper said.

"No, they ought to go all right. They'll be O. K. after they limber up a little."

An extra chair car was added to the train next morning. A presidential candidate was speaking in Sanford that afternoon and an unusual number of passengers was expected.

It happened eighteen miles out of Plainville. Both bearings went out. Tight as they were they might have made it if broken in gradually and with oil pressure up to normal. Other bearings in the engine being loose allowed the oil to escape and relieve the pressure. The tight bearings that needed it most didn't get the oil. Metal rubbed against metal instead of on the protecting film of oil.

The train was pulling up the hill out of Clear Creek bottom. Throttles were wide open. The engineer was leaning forward as though he would help the pounding engines pull the load up the hill. Stewart glanced at the voltmeter and the speed indicator. He made a motion to shift the controller to series position but hesitated. About two hundred yards more and the car would nose over the hill.

As his hand paused on the controller handle there was an unfamiliar rattle mingled with the roar of the exhausts and clatter of the engines. The engineer closed the throttle a couple of notches. The laboring car slowed down and he again opened the throttle wide. There was an unmistakable pound of metal against metal.

Stewart looked back at the engines with an inquiring gaze. Then he saw the oil gauge for the number two engine. Pressure had dropped almost to zero. Twenty-five more yards and the train would be over the hill. It made it over but not much farther. With one engine pulling, the car stalled on the next grade. The conductor walked four miles to the nearest telephone and called the dispatcher, while impatient passengers fumed and fretted at the delay. Most of them that had bought tickets swore to never go by train again, especially if the train was pulled by a motor car.

The crank shaft in the number two engine was ruined. The motor car was laid up ten days waiting for a new one and putting it in. Anderson went to Plainville presumably to oversee the job of repairing the engine. He did most of the work.

When the master mechanic learned what had happened he broke his own altitude record. When told how much it was going to cost to put the car in shape and suitable for service, Evans thought that worthy official was going to have apoplexy.

Both the engineer and the maintainer were called in on the carpet to explain why the bearings had burned out. Stewart admitted that he had not reported the bearings on the previous trip. Baker said that he had examined them when the car came in and they were apparently O. K. He neglected to say that he had tightened the bearings the night before the car went out.

"Well, dammit, what caused the trouble? Anderson, can you tell?"

The motor car supervisor hesitated before replying. "Well, if the bearings were O. K. when the car went out, I can't say just what caused it. I've examined the oil pump and lines, they're all right, and the strainer wasn't stopped up. Looks to me like the bearings were too tight, but Baker says he looked at them."

The maintainer flushed. "Yeah, I looked at 'em. That oil we've been getting lately don't look so good," he added.

"I'll have the oil tested," Anderson said, "but it's the same as we're using everywhere."

"Don't you have trouble anywhere but here?" Carter asked testily.

"Yes, we have trouble at other places, too, but not so much some places as others. Some maintainers and engineers seem to have more success maintaining and running the cars than others."

"I don't want to run the blamed car," Stewart flared. "Give me a locomotive every time!"

"You qualified the men yourself," Carter reminded. "If they're not competent, you're the responsible one."

Anderson raised up in his chair, then settled back. No use arguing with the master mechanic. What he wanted to tell him was that the whole set-up regarding motor cars was wrong.

Steam training doesn't fit a man to run a motor car any more than his having been a motorman on a street car qualified him to run a locomotive. As far as maintainers are concerned, it is more a matter of luck than circumstance when by chance a good one is acquired."

The motor car supervisor wanted to tell the master mechanic that and more. He wanted to tell him that for proper and economical service motor cars should be maintained by men especially trained to maintain motor cars, not steam locomotives, and operated by men trained for the purpose. He wanted to tell him about the lack of proper supervision of motor car maintenance and operation, but he didn't. He knew it wouldn't do any good.

Sixty days later the superintendent of motive power heeded Carter's importunities and sent the motor car to another division.

"I'm blamed glad to see it go," Carter said. "The damned things are always giving trouble and are expensive to maintain."

Jim Evans took a fresh chew of horseshoe when he got the message that the motor car was being taken away, and remarked, "Well, I guess we'll have to find some other excuse for our M. of E. charges running over now."

Treating Railway Water

(*Continued from page 409*)

duced to a safe operating degree, very satisfactory results are being obtained. This method is particularly adapted to small water supplies as well as large supplies where the hardness in the natural water or local conditions do not justify the expense of complete treatment.

Boiler compounds have been used for many years, and it is a matter of record in the past that the use of such material in a haphazard way was an aggravation rather than a help in maintaining a satisfactory boiler condition. The intelligent use of a legitimate boiler compound has a decided field in railway water service. Such a compound should only be used after a complete survey has been made of the water situation, the required treatment determined beforehand and formulated accordingly. The old "mystery formulae" are not to be considered by anyone having the interest of railroads at heart.

All of the railroads have found by experience that improving the locomotive water supply results in a large return on the investment. Water treatment has been a vital factor in the extension of locomotive runs, increased fuel mileage, elimination of engine failures and a general reduction in the cost of fuel and enginehouse expense. The actual expenses made for the necessary chemicals are returned many times in the course of a year.

Water treatment without full co-operation of the mechanical department is a difficult problem. When a program of improvement in water supply is contemplated, the engineering forces should co-operate completely with the mechanical forces, and the responsibility for treatment and results should be centralized.

After a program of improvements has been installed, the operation of the softening plants, as well as the instructions and education of all of the mechanical forces, including the men operating the locomotives and those

who have charge of boiler washing, etc., should be such that all are thoroughly familiar with what is occurring when the water supply has been changed to eliminate trouble due to unsuitable water.

The railroad managements are keenly alive to the improved and economical conditions resulting from an intelligent solution of this problem, and by friendly cooperation of mechanical and engineering forces, operating delays and trouble chargeable to water conditions can be successfully eliminated.

When engine crews become familiar with treated water and its action in a boiler, they have no trouble handling locomotives under the most severe operating conditions. Properly treated water will not cause crown sheet trouble or any other trouble in locomotive operation. Water treatment is a common-sense solution to unsuitable water troubles, and very gratifying results are obtained by common-sense methods.

Latest Developments in Shielded Arc Welding*

By A. M. Candy

Those who have been concerned with welding for several years can recall the early days when we had to weld with any old kind of wire we could get our hands on. Swedish iron wire at one time was supposed to be the best thing available. It was quite customary to pick up any coil of wire and cut a chunk out of it. In a great many cases, bail haywire was used, and the results were naturally none too satisfactory. That is the origin of the term "haywire." When you apply it as a welding term, you mean that the job has failed.

Many years ago, in England and other European countries, covered electrodes were developed, but they did not find very extensive use in this country for a good many years. Later it was realized in this country that if welding science was to progress, better results would have to be obtainable. Covered electrodes were developed, therefore, which have resulted in a very high degree of satisfactory performance today. Probably the latest development in covered electrodes is the development of a rod having a coating on it that gives the desirable ductility and tensile strength and at the same time permits that rod to be used on the negative side of the arc; in other words, the same polarity that has in the past given the best results when a bare electrode was used. That of itself can be a very distinct advantage, especially in some particular cases.

For example, covered electrodes naturally cost more to make than the so-called bare electrodes. So if one has a job that can be performed satisfactorily with a bare electrode, in some cases at least, welding work can be carried out somewhat less expensively than it can be using covered electrodes. Therefore, if in a combination job it is desirable to switch from a bare rod to a covered rod, it is naturally helpful at least to be able to stick the rod in the electrode holder and proceed without having to think about going back to the machine and throwing a reversing switch or whatever might be necessary. For this reason, the development of the negative covered rod is probably one of the outstanding developments of the recent months.

One of the other later developments in the covered electrode field is that of developing electrodes which can be used in any position. The earlier electrodes of the shielded arc type which were developed worked fine for downward welding in a flat position, but when it came to vertical work and overhead work they were not satisfactory at all. Further research and investigation and testing resulted in the development of electrodes which are satisfactory for vertical work as well as overhead work. [Mr. Candy here showed about 50 slides of typical railway shop electric-welding operations. In discussing the practice of welding cracked driving wheel spokes at the Illinois Central shops, Paducah, Ky., Mr. Candy made the statement given below.—EDITOR.]

The welding work is done with the covered electrode, and naturally in welding over the side of the spoke a certain amount of tear drop material rolls over and accumulates, and the finished job must be smooth, so the welders take advantage of one of the peculiarities of the covered electrode plus the very good long-arc characteristics of our modern welding machines and by turning the current up a little bit and holding a long arc they can smooth that whole mass down as well as if ground with an emery wheel, and that saves considerable money.

* Presented by A. M. Candy, Consulting engineer, Hollup Corporation, at the Midwest Welding Conference, held by this company at Chicago on June 5.

Filling Link Blocks With Soft Grease

By James E. King

The arrangement illustrated provides a simple and easy method of lubricating the link blocks of a locomotive on which soft grease is employed as a lubricant—a practice now quite generally followed. Where this device is used, the link blocks are provided with a permanent grease cavity or are fitted with grease cups.

The device itself consists of a piece of flexible pipe, about 2 ft. long, one end of which is provided with a receptacle for connection to the long hose leading to the portable grease tank and the other end provided with a slide attachment which drops over the grease cup on the top of the link block. Then, after coupling the attachment to the grease hose, a few strokes of the pump are sufficient to fill the link-block receptacle with grease. The reverse lever in the cab does not need to be touched provided the block has not been moved to the top of the link. If in any other position the device can be used with a considerable saving in time and labor. This device has been used satisfactorily for a number of years.

A short flexible pipe with suitable attachments provides a convenient means for filling link-block grease cups

Among the Clubs and Associations

Central Railway Club of Buffalo.—"Why Federal Inspection?—One Quarter of a Century or Twenty-Five Years of Locomotive Inspection by the Federal Government" will be discussed by John M. Hall, chief inspector, Bureau of Locomotive Inspection, Interstate Commerce Commission, Washington, D. C., before the meeting of the Central Railway Club of Buffalo to be held on September 10 at 8 p.m., daylight saving time, at the Hotel Statler, Buffalo, N. Y.

Car Foremen's Association of Chicago.—O. E. Ward, general superintendent of motive power of the Chicago, Burlington & Quincy, will lead in the discussion of maintenance of coal carrying equipment which will follow the presentation of "The Story of a Famous Coal" by the Bell & Zoller Coal Company at the meeting of the Car Foremen's Association of Chicago to be held at 8 p.m., eastern standard time, on September 14 at the La Salle Hotel, Chicago. Moving pictures will be used to illustrate the story on coal.

Traveling Engineers' Association.—The fortieth annual meeting of the Traveling Engineers' Association will be held on September 15 and 16 at the Hotel Sherman, Chicago. Six subjects will be discussed at this meeting: (1) Of What Benefit Is the Road Foreman or Traveling Engineer to the Railroads?; (2) What Has Been Accomplished by Extended Locomotive Runs?; (3) Progress in Draft Appliances and the Effect on Present-Day Locomotives; (4) Brakes as Used on Streamline Trains, Gas or Oil or Electric, Handling and Operating and Maintenance; (5) New Super Speed Passenger Locomotives, and (6) the question of the amalgamation of the Traveling Engineers' Association and the International Railway Fuel Association.

American Welding Society.—The seventeenth annual meeting of the American Welding Society will be held on October 19-23, inclusive, at the Hotel Cleveland, Cleveland, Ohio. On Thursday, October 22, there will be joint sessions of the American Welding Society with the American Society of Mechanical Engineers, at which the following papers will be presented: Stress Analysis, by C. H. Jennings, Westinghouse Electric & Manufacturing Co.; Alloy Steels and Their Weldability, by A. B. Kinzel, Union Carbide and Carbon Research Labs.; Welding Heavy Machinery and Equipment, by C. A. Wills and F. L. Lindemuth, Wm. B. Pollock Company; Steel Plate Construction, and Using Steel Plates for Machine Frames. At sessions on Friday, October, 23, to which American Welding Society members are invited, members of the American Society of Mechanical Engineers will discuss the Weldability of Non-Ferrous Metals—copper, brass and bronze, monel metal and aluminum. Welding developments as they affect mechanical design will also be discussed, as well as the welding of light machines and products and the principles involved in selecting casting vs. welding. Among other papers to be presented at earlier sessions are: Fundamentals of Metallurgy of Welding by E. S. Davenport and Dr. R. H. Aborn, United States Steel Corporation; The Welding of Copper, by A. P. Young, Michigan College of Mining and Technology; Principles of Surfacing by Welding, by E. W. P. Smith, Lincoln Electric Company, and Thermit Welding, by J. H. Deppeler, Metal & Thermit Corporation. High-speed motion pictures of various welding processes will be shown by E. Vom Steeg, General Electric Company, and W. E. Crawford and Walter Richter, A. O. Smith Corporation. The Metal Congress Exposition will be held simultaneously at the Public Auditorium, Cleveland.

DIRECTORY

The following list gives names of secretaries, dates of next regular meetings, and places of meetings of mechanical associations and railroad clubs:

Air-Brake Association.—T. L. Burton, care of Westinghouse Air Brake Company, 3400 Empire State Building, New York.

Allied Railway Supply Association.—F. W. Venton, Crane Company, Chicago.

American Railway Tool Foremen's Association.—G. G. Macina, 11402 Calumet avenue, Chicago.

American Society of Mechanical Engineers.—C. E. Davies, 29 West Thirty-ninth street, New York.

Railroad Division.—Marion B. Richardson, 192 East Cedar street, Livingston, N. J.

Machine Shop Practice Division.—G. F. Nordenholt, 330 West Forty-second street, New York.

Materials Handling Division.—F. J. Shepard, Jr., Lewis-Shepard Co., Watertown Station, Boston, Mass.

Oil and Gas Power Division.—M. J. Reed, 2 West Forty-fifth street, New York.

Fuels Division.—W. G. Christy, Department of Health Regulation, Court House, Jersey City, N. J.

Association of American Railroads.—J. M. Symes, vice-president operations and maintenance department, Transportation Building, Washington, D. C.

Division I.—Operating.—Safety Section.—J. C. Caviston, 30 Vesey street, New York.

Division V.—Mechanical.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

Committee on Research.—E. B. Hall, chairman, care of Chicago & North Western, Chicago.

Division VI.—Purchases and Stores.—W. J. Farrell, 30 Vesey street, New York.

Division VIII.—Motor Transport.—Car Service Division.—C. A. Buch, Transportation Building, Washington, D. C.

Association of Railway Electrical Engineers.—Jos. A. Andreucetti, C. & N. W., 1519 Daily News Building, 400 West Madison street, Chicago, Ill. Annual meeting, October 27-29, Hotel Sherman, Chicago.

Canadian Railway Club.—C. R. Crook, 2271 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month, except in June, July and August, at Windsor Hotel, Montreal, Que.

Car Department Officers' Association.—A. S. Sternberg, master car builder, Belt Railway of Chicago, 7926 South Morgan street, Chicago.

Car Foremen's Association of Chicago.—G. K. Oliver, 2514 West Fifty-fifth street, Chicago. Regular meetings, second Monday in each month, except June, July and August, La Salle Hotel, Chicago.

Car Foremen's Association of Omaha, Council Bluffs and South Omaha Interchange.—H. E. Moran, Chicago Great Western, Council Bluffs, Ia. Regular meetings, second Thursday of each month at 1:15 p. m.

Central Railway Club of Buffalo.—Mrs. M. D. Reed, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meetings, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

Eastern Car Foremen's Association.—E. L. Brown, care of the Baltimore & Ohio, St. George, Staten Island, N. Y. Regular meetings, fourth Friday of each month, except June, July, August and September.

Indianapolis Car Inspection Association.—R. A. Singleton, 822 Big Four Building, Indianapolis, Ind. Regular meetings, first Monday of each month, except July, August and September, at Hotel Severin, Indianapolis, at 7 p. m.

International Railway Fuel Association.—T. D. Smith, 1660 Old Colony Building, Chicago.

International Railway General Foremen's Association.—William Hall, 1061 West Wabasha street, Winona, Minn.

International Railway Master Blacksmiths' Association.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

Master Boiler Makers' Association.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y. Annual meeting, September 16 and 17, Hotel Sherman, Chicago.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meetings, second Tuesday in each month, except June, July, August and September, at Copley-Plaza Hotel, Boston.

New York Railroad Club.—D. W. Pye, Room 527, 30 Church street, New York. Meetings, third Friday in each month, except June, July, August and September, at 29 West Thirty-ninth street, New York.

Northwest Car Men's Association.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meetings, first Monday each month, except June, July and August, at Midway Club rooms, University and Prior avenue, St. Paul.

Pacific Railway Club.—William S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately—June in Los Angeles and October in Sacramento.

Railway Club of Greenville.—J. Howard Waite, 43 Chambers avenue, Greenville, Pa. Regular meetings, third Thursday in month, except June, July and August.

Railway Club of Pittsburgh.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Regular meetings, fourth Thursday in month, except June, July and August, Fort Pitt Hotel, Pittsburgh, Pa.

Railway Fire Protection Association.—R. R. Hackett, Baltimore & Ohio, Baltimore, Md.

Railway Supply Manufacturers' Association.—J. D. Conway, 1941 Oliver Building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, Association of American Railroads.

Southern and Southwestern Railway Club.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings, third Thursday in January, March, May, July and September. Annual meeting, third Thursday in November, Ansley Hotel, Atlanta, Ga.

Toronto Railway Club.—R. H. Burgess, Box 8, Terminal A, Toronto, Ont. Meetings, fourth Monday of each month except June, July and August, at Royal York Hotel, Toronto, Ont.

Traveling Engineers' Association.—Miss E. Earl, acting secretary, 10213 Hampden avenue, Cleveland, Ohio. Annual meeting, September 15 and 16, Hotel Sherman, Chicago.

Western Railway Club.—C. L. Emerson, executive secretary, 822 Straus Building, Chicago. Regular meetings, third Monday in each month, except June, July, August and September.

First Canadian Pacific "Jubilee" locomotive, built by the Montreal Locomotive Works

This locomotive, one of five for high-speed passenger service, was delivered to the Canadian Pacific in a formal and colorful ceremony on Monday, July 27. It is of the 4-4-4 type. The boiler carries a working pressure of 300 lb. per sq. in.; the cylinders are 17¼ in. by 28 in.; the driving wheels, 80 in. in diameter, and the tractive force, 26,500 lb. The total weight of the engine is 263,000 lb. It is known as the Jubilee type in celebration of the fiftieth anniversary year of the establishment of transcontinental passenger service by the Canadian Pacific.

NEWS

Pneumatic-Tired Rail Cars in Great Britain

The London, Midland & Scottish of Great Britain is experimenting with pneumatic-tired rail motor cars, according to a recent statement from the Associated British Railways, Inc., New York. The cars, with capacity for 56 passengers, have 16 pneumatic-tired wheels. Each is powered with a 275-hp. gasoline engine designed for a cruising speed of 60 m.p.h., with a maximum speed of about 75 m.p.h. The cars are described as "faster and more powerful than any single car units ever tested in Great Britain." Also, they carry new experimental equipment designed to operate signaling track-circuits and fog detonators.

Foot-Warmers and Arm Chairs for Brakemen

Now that the Pullman surcharge has been abolished and passengers are being furnished with better seating and other facilities at lower rates, the railroad brakemen are demanding better service also and some of the facilities of the driver of the private automobile with which the railroads, or at least the Interstate Commerce Commissioners, are trying to compete.

A. F. Whitney, president of the Brotherhood of Railroad Trainmen, has filed with the Interstate Commerce Commission a complaint asking it, as a safety measure, to require the railroads to equip their locomotives with "proper and adequate" seating facilities for all members of train crews who are required to ride upon locomotives or the head ends of trains. These seating facilities are to be equipped with spring cushions and spring cushion back rests, foot warmers, and padded arm rests, and where there is only one window on the fireman's side of the cab the commission is asked to require two windows, one for the forward brakeman and one for the fireman. In addition the commission is asked to require that hot steam pipes on the right side of the engine boiler be removed and placed back of the locomotive boiler head so as to prevent injury to employees from burns.

The present seating arrangement for head brakemen, the complaint says, "endangers the health, comfort, and general welfare of trainmen by unduly exposing them to extreme weather conditions, unnecessary danger and hazard in the event of an explosion in the firebox," and it is also said to endanger travelers upon the highways by rendering trainmen incapable of keeping an effective lookout, although in a proceeding now pending before the commission on a complaint of the enginemen's brotherhoods the firemen ask to be relieved of firing by the installation of automatic stokers so that they may keep a steady lookout.

New Equipment in Order

More new freight cars were on order by Class I railroads of the United States on July 1, this year, than on any July 1 since 1929, according to the Association of American Railroads. Orders for new freight equipment on July 1 called for 28,089 cars, compared with 2,428 new freight cars on July 1, 1935, and 17,813 cars on July 1, 1934. On July 1, 1929, equipment orders included 39,638 new freight cars. New freight cars on order on June 1, this year, totaled 25,748.

New locomotives on order July 1, included 67 steam and 23 of the electric and Diesel types, compared with six steam locomotives and 22 electric locomotives on order on July 1, 1935; and 40 steam and 107 electric locomotives on order July 1, 1934. New steam locomotives on order on June 1, this year, totaled 58, and new electric and Diesel locomotives 30.

New freight cars placed in service in the first six months this year totaled 11,604, compared with 1,868 in the corresponding period of 1935 and 5,362 in the same period of 1934. Eighteen new steam locomotives and 11 new electric and Diesel locomotives were placed in service in the first half of this year, compared with 25 steam and 81 electrics commissioned in the first six months of 1935, and one steam and eight electrics placed in service the first half of 1934.

Industrial Research

The Subcommittee on Industrial Research of the Engineering Foundation Welding Research Committee held a two-day session, July 23-24, at Watertown Arsenal, Watertown, Mass. Col. G. F. Jenks, commanding officer of the Arsenal and chairman of the Subcommittee, presided at the various sessions. He stated that the purpose of the conference was to complete the organization of the sub-subcommittees preliminary to the analysis of research activities being conducted to solve the many complicated problems in the welding field.

The work was divided among various sub-subcommittees, including the following material sub-subcommittees: Cast Iron, Carbon Steels, Low Alloy Steels, High Alloy Steels, Aluminum Alloys, Copper Alloys, and Nickel Alloys. Functional sub-subcommittees on Methods of Testing, Analysis of Weld Failures, and Weld Stresses—Causes and Effects are being organized.

The two-day session included the presentation of papers and reports on radiography, monel metals, low alloy steels and high velocity impact tests. Members of the Subcommittee had an opportunity to witness various welding operations at the Arsenal, the centrifugal casting of low alloy steel, and the testing of metals under impact loads delivered at the rate of more than 300 ft. a second.

A second conference is planned for the middle of October in Cleveland during the annual convention of the American Welding Society and the Metal Congress Exposition.

Dr. C. E. Adams, chairman of the Welding Research Committee, reported that the Engineering Foundation had made three grants, totaling $12,000, to launch the project and that leaders of industry had pledged whole-hearted co-operation.

Research Advancing Rail Transport, Says Wallace

Research advancing rail transportation is proceeding on a vast scale, according to L. W. Wallace, director of the Division of Equipment Research of the Association of American Railroads, who declared in a recent statement that "the railroad industry stands on the threshold of one of the most active and fruitful eras of its history." Pointing out that the railroads are purchasers of more than 70,000 commodities, Mr. Wallace asserted that through the network of relationships built up around the transportation system of the United States a very large research per-

sonnel is working directly and indirectly in behalf of the railroad industry.

"These many relationships," he continued, "mean that of the hundreds of millions of dollars spent annually for research by such industries as the steel, chemical, electric, textile, railway supply, and others, a measurable amount is spent directly in response to the needs of the railroad industry. In the last analysis the railroad industry pays a measurable amount of the cost of such research as is devoted to developing the commodities it uses in the price it pays for such commodities."

Mr. Wallace explained that the railroad industry is necessarily confined to applied research as are all others who purchase materials and equipment for their individual use.

"The Division of Equipment Research," he said, "realizes that it would be thoroughly impracticable and inadvisable to have a staff and laboratory facilities adequate in size and quality to deal with the great number of research problems which it will be expected to and must consider. The Division will therefore maintain a relatively small staff and will purchase only such special equipment as may be needed and is not available in some laboratory. As each problem arises it will enlist the services of the best talent and facilities available for such research. Thus, there will continue to be brought to bear upon the railroad research problems the highest degree of scientific and professional talent. Today two of the leading metallurgical research institutions are working on problems assigned to them. Three of the large technical institutions are likewise working on assigned problems. The research program on the air conditioning of railroad passenger cars recently authorized is being so organized that the best research facilities of manufacturers, railroads, and technical universities will be used."

Enumerating other research tasks of the railroads, Mr. Wallace describes the development of the locomotive, stressing the possibilities of the more recently constructed locomotive laboratories of the University of Illinois and the Pennsylvania Railroad.

New Equipment

Locomotive Orders

Road	No. of locomotives	Type of locomotive	Builder
Conemaugh & Black Lick.......	2*	0-8-0	American Loco. Co.
Mexican National Construction Co.	2†	2-6-6-2	American Loco. Co.
Monessen Southwestern (Pittsburgh Steel Co.)............	1‡	0-6-0	American Loco. Co.
Union Pac.	1§	Steam-turbo elec.	General Elec. Co.

Locomotive Inquiries

Road	No. of locomotives	Type of locomotive	Builder
Birmingham Southern	10	Diesel-elec.	....
Carnegie-Ill. Steel Corp.........	1	0-4-0	....

Freight Car Orders

Road	No. of cars	Type of car	Builder
Birmingham Southern	100	Box	Pullman-Std. Car Mfg. Co.
	25	Gondola	Pullman-Std. Car Mfg. Co.
Union Tank Car Co............	3,000	6,500-gal. tank	American Car & Fdry. Co.
Youngstown & Northern........	100	70-ton gondolas	Greenville Steel Car Co.

Freight-Car Inquiries

Road	No. of cars	Type of car	Builder
Missouri Pacific	200	40-ton box	....

* These locomotives will have 25-in. by 28-in. cylinders and a total weight in working order of 231,000 lb.

† These locomotives will have 15-in. by 22-in. cylinders and a total weight in working order of 216,000 lb.

‡ This locomotive will have 22-in. by 28-in. cylinders and a total weight in working order of 181,000 lb.

§ Briefly described on page 338 of the August *Railway Mechanical Engineer.*

Articulated Pullman Car Ready for Service

The light-weight streamline two-body articulated passenger car, which the Pullman-Standard Car & Manufacturing Company has had under construction for the Pullman Company, has now been completed and is soon to be placed in service in various regular trains throughout the country so that public reaction to the new features involved may be studied. This car, which is designed for rear-end operation, consists of a sleeping unit containing 16 "duplex" bedrooms arranged in two levels and a combination sleeping and observatory lounge unit.

Following one week's operation on the Twentieth Century Limited of the New York Central and another on the Broadway Limited of the Pennsylvania, the car is being transferred to service on other railroads throughout the country. The car, which is of alloy steel construction with interior trim of aluminum alloy, was described briefly in the May, 1935, issue of the *Railway Mechanical Engineer,* page 212.

"Speed-Endurance" Record Claimed for British Train

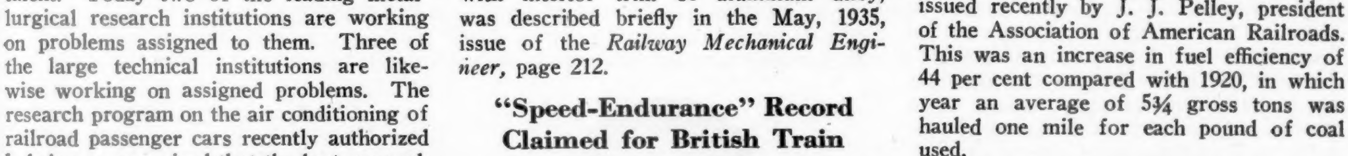
The London & North Eastern of Great Britain claims for its "Silver Jubilee" the "world's speed-endurance record for steam trains," according to a recent statement issued by the Associated British Railways, Inc., New York. The claim is based on the fact that the Silver Jubilee has recently completed 100,000 miles of high-speed operation in the period of nine months; it has averaged 67.1 m.p.h. on its regular run of 268 miles between Newcastle and London. An analysis of the train's record shows that it has, without loss of time attributable to the locomotive, run 100,000 miles at an average speed of 67.1 m.p.h.; 86,567 miles at 70.4 m.p.h.; and 18,283 miles at speeds "exceeding 80 m.p.h."

Four locomotives are now assigned to the Silver Jubilee—the "Silver Link," the "Silver King," the "Silver Fox" and "Quicksilver." Attention is called to the fact that only one set of cars for the train is available and that these cars have run the 100,000 miles without developing mechanical defects.

Increased Efficiency in Fuel Consumption

For each pound of coal consumed in freight service, the railroads of the United States in 1935 hauled 8⅓ tons a distance of one mile, according to a statement issued recently by J. J. Pelley, president of the Association of American Railroads. This was an increase in fuel efficiency of 44 per cent compared with 1920, in which year an average of 5¾ gross tons was hauled one mile for each pound of coal used.

In the past sixteen years, the statement continues, there has been an almost constant increase in efficiency obtained in fuel consumption, both in freight and passenger service, with a substantial saving in the fuel bill of the railroads. The foregoing is attributed by Mr. Pelley to a large number of factors, including improvements in the construction of new locomotives, modernization of older locomotives by equipping them with up-to-date improvements to aid combustion; improved methods of operation to keep trains moving with a minimum number of stops, and the continuing progress in scientific methods of chemically treating boiler water, in order to eliminate so far as possible ingredients harmful to locomotives. Improvements in scientific methods used to determine just which grades of coal are best adapted for locomotives have also contributed to increased fuel consumption efficiency.



Pullman articulated car having bedrooms arranged in two levels and a combination sleeping and observation-lounge unit

Two New Locomotives for the L. & N. E.

Two new locomotives have recently been completed in the shops of the London & North Eastern of Great Britain. One, which has been named the "Green Arrow," is of the 2-6-2 type and has been designed for hauling fast passenger and freight trains; the other, called "Lord President," is of streamline design and will be used for hauling fast passenger trains over the east coast route between Edinburgh and Aberdeen.

The Green Arrow is described as the first locomotive of its class to be built in Great Britain. It has three cylinders 18½ in. in diameter and with a 26 in. stroke, and a total weight in working order of 144 tons. An additional 32 locomotives of this type are to be built in L. N. E. shops.

The Lord President, described as a modification of the "Earl Marischal," comprises with the latter and the "Cock o' the North" the "most powerful passenger locomotives in Great Britain." Its streamlining is similar to that of the "Silver Link" which hauls the L. N. E.'s "Silver Jubilee" train. It has three cylinders, each 21 in. by 26 in., and a total weight in working order of 167 tons. Three other locomotives of this type are under construction. All have been designed by Sir H. N. Gresley, chief mechanical engineer, L. & N. E.

Supply Trade Notes

THE INLAND STEEL COMPANY, Chicago, has established a Chicago district sales office with Leon C. Reed as district sales manager and Otto G. Neumann as assistant district sales manager.

BLAKE C. HOWARD has been placed in charge of all railroad business for L. C. Chase & Company, Inc., selling division of Goodall-Sanford Industries in the St. Louis, Mo., area. Mr. Howard's headquarters will be in the Railway Exchange building.

THE MCINTOSH & SEYMOUR CORPORATION, Auburn, N. Y., a wholly owned subsidiary of the American Locomotive Company, has been merged with the parent company and the business heretofore conducted by that corporation is now carried on by the American Locomotive Company, Diesel Engine Division, Auburn. In the merger the American Locomotive Company has acquired the assets of the McIntosh & Seymour Corporation, including the manufacturing plant at Auburn, sales orders and contracts, and the operating, sales and administrative personnel, and has assumed all the liabilities, including contracts and orders for the purchase of materials and supplies. Robert B. McColl, president of the McIntosh & Seymour Corporation, has been appointed vice-president of the American Locomotive Company, Diesel Engine Division, and Henry T. Sherman, John Thomas and Heinrich Schneider have been appointed assistant vice-presidents. The Diesel Engine Division of the American Locomotive Company will continue to build and supply the complete line of McIntosh & Seymour four-cycle Diesel designs. There has also been added the two-cycle Diesel designs of Sulzer Brothers, Winterthur, Switzerland, to be built and sold in America under the trade name Alco-Sulzer.

THE FULTON SYLPHON COMPANY, Knoxville, Tenn., specialists in temperature controlling equipment, has formed a Railway Equipment Division, with headquarters in the Drexel building, Philadelphia, Pa. This division, headed by Thomas Kenny, will concentrate upon serving railroad air-conditioning control requirements.

W. G. ROBBINS, vice-president and general sales manager of the Carboloy Company, Inc., has been elected president to succeed Dr. Zay Jeffries, who became chairman of the board upon the retirement of P. R. Mallory. A. MacKenzie, manager of manufacturing, has been elected vice-president in charge of manufacturing; K. R. Beardslee, Pittsburgh district sales manager, has been appointed general sales manager of the Carboloy Company; J. R. Longwell, die engineer, has been appointed chief engineer, and A. A. Merry, Cleveland district sales manager, has been appointed special representative in charge of activities with agents licensed to supply Carboloy on their tools, dies and machines. A. H. Godfrey has been appointed Cleveland district manager, and P. W. Weieser becomes manager of the Pittsburgh district.

FRANK H. HARDIN, whose election to the presidency of the Association of Manufacturers of Chilled Car Wheels to succeed J. A. Kilpatrick was announced in the August issue of the *Railway Mechanical Engineer*, was born in Gainesville, Ga., on June 14, 1886, and in 1908 he was graduated from the Georgia School of Technology with a degree of Bachelor of

Blank-Stoller, Inc.

F. H. Hardin

Science in Mechanical Engineering. After postgraduate work at Columbia University, New York, Mr. Hardin entered railroad service in 1909 as a special apprentice on the New York Central, his entire railroad career having been in the service of that road. From 1912 until 1914 he was successively assistant enginehouse foreman and enginehouse foreman; and during the three following years, until 1917, he was special engineer to the office assistant to the president. In 1917-18 Mr. Hardin was master mechanic at Utica, N. Y., becoming in the latter year assistant to the federal manager, a position which he retained until 1920. Next he was chief engineer of motive power and rolling stock, a position which he held until 1926, the year of his appointment as assistant to the president. Mr. Hardin has been a member of the General Committee of the Mechanical Division, Association of American Railroads, continuously since 1924. He is a member of the A. S. M. E.

A. R. ELLIS, vice president and director of the Pittsburgh Testing Laboratory, has been elected president, retaining also his directorship. Mr. Ellis was born in Pittsburgh, Pa., and educated in the public schools of that city. He is a graduate of Cornell University, Ithaca, N. Y., where he obtained the degree of civil engineer in 1905. During the same year he became a laboratory technician in the employ of the Pittsburgh Testing Laboratory, later becoming an inspector of engineering materials and finally, in 1910, chief engineer. In 1917 he was appointed manager of the New York branch of the Pittsburgh Testing Laboratory; in 1918, assistant general manager; in 1921, general manager and director, and in 1929, vice-president and director. Mr. Ellis is a member of a number of technical societies, including the American Society of Civil Engineers; American Society for Testing Materials; American Welding Society, and the American Institute Steel Construction.

THOMAS CRUTHERS, assistant vice-president in charge of sales, has been appointed vice-president of the Worthington Pump & Machinery Corporation, Harrison, N. J. Mr. Cruthers was graduated from Stevens Institute of Technology with the degree of mechancial engineer and then entered the employ of the Westinghouse Machine Corporation, serving as superintendent of gas engine erecting. In 1907, in the same capacity, he entered the service of the Snow Steam Pump Works, a Worthington subsidiary, at Buffalo, N. Y. In 1908 he was transferred to the Worthington sales department in the Pittsburgh district, and subsequently to various other district offices until 1927, when he was appointed New York district sales manager. Three years later he was appointed assistant general sales manager and two years later became assistant vice-president in charge of sales. Mr. Cruthers will direct the corporation's sales activities in the steam power stations, railroad, waterworks and sewage fields and will also have charge of the general traffic department.

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PAUL C. CADY, who has been elected vice-president in charge of sales for the eastern district of the Union Railway Equipment Company, Chicago, with headquarters in New York, was educated at Baldwin University Law School and began

Bachrach

Paul C. Cady

his railway career in the mechanical department of the Lake Shore & Michigan Southern at Cleveland, Ohio. Later he was employed in the mechanical department of the New York Central at New York, and in 1919 resigned as assistant to the chief mechanical engineer of this road, to enter the railway supply business. Since that time he has been engaged in the railway supply business in New York, at the present time also being president of the Midland Supply Company.

Obituary

O. H. MELLUM, assistant vice-president of the American Car & Foundry Company, with headquarters at Chicago, was killed in Lake Bluff, Ill., on August 14, when he was struck by a train while alighting from another train at that station.

ROBERT J. SHARPE, manager of sales of the General American Tank Car Corporation for the Tulsa district, died suddenly at Palmer Lake, Colo., on July 27. Mr. Sharpe had been connected with this company for 25 years.

JOHN W. KINCADE, who invented one of the first automatic locomotive stokers, died at his home in Cincinnati on July 31, at the age of 68. While working as a locomotive engineer on the Chesapeake & Ohio he devised a stoker, which was at first worked by hand, but later by steam. Several were used on this road with the long firebox locomotives, but were discontinued when the wider firebox design was introduced. The stoker was improved and became known as the Day-Kincade, and later on as the Victor, but never got beyond experimental use.

JOHN C. WHITRIDGE, president and general manager of the Buckeye Steel Castings Company, died at Columbus, Ohio, July 29. Mr. Whitridge was 64 years of age and a native of Richmond, Ind. He received his higher education at Purdue University, graduating in mechanical engineering with the class of 1895. After leaving college, he became associated with D. L. Barnes, a consulting engineer at Chicago, and subsequently became connected with the editorial staff of the Railroad Gazette (now incorporated in the Railway Age). In 1902 he joined the Buckeye Steel Castings Company as assistant general manager; in 1920 was appointed vice-president, and in 1927 became president and general manager. The introduction of steel castings for automatic car couplers and for railroad car trucks were developments that took place during Mr. Whitridge's association with the Buck-

John C. Whitridge

eye Steel Castings Company. From 1912 to 1915 he was a member of the Executive Committee of the Railway Supply Manufacturers Association, and at the time of his death he was treasurer and a trustee of the Ohio Manufacturers Association.

Personal Mention

General

C. P. DAMPMAN, supervisor of fuel conservation of the Reading, at Philadelphia, Pa., has been granted an indefinite leave of absence on account of illness.

N. M. TRAPNELL, special engineer of the Chesapeake & Ohio at Richmond, Va., has been appointed mechanical engineer, succeeding E. R. Hauer, transferred.

J. M. KERWIN, superintendent motive power of the Chicago, Rock Island & Pacific, with headquarters at Silvis, Ill., has moved his headquarters to Kansas City, Mo.

H. MORRIS, superintendent fuel and locomotive performance of the Central of New Jersey at Jersey City, N. J., has had his jurisdiction extended to include the Reading Company.

F. L. CRISSEY, general shop foreman of the Denver & Rio Grande Western at Salt Lake City, Utah, has been appointed assistant mechanical superintendent, with headquarters at Denver, Colo.

H. W. CATHCART has been appointed assistant superintendent fuel and locomotive performance of the Central of New Jersey and the Reading, and the position of fuel inspector of the Reading has been abolished.

WALTER E. SAMPLE, supervsior of locomotive operation of the Baltimore & Ohio at Pittsburgh, Pa., has been appointed assistant to chief of motive power and equipment, succeeding F. Kirby, deceased.

J. E. DAVENPORT, assistant to vice-president and general manager of the New York Central System, has been appointed assistant chief engineer motive power and rolling stock, with headquarters at New York.

JOHN PFEIFFER, superintendent motive power of the Ft. Worth & Denver City, has been appointed also to the position of superintendent of motive power on the Colorado & Southern to succeed H. W. Ridgway, who has retired. Mr. Pfeiffer will maintain offices at both Denver, Colo., and Childress, Tex.

P. C. WITHROW, mechanical engineer of the Denver & Rio Grande Western, has been appointed acting general mechanical superintendent, with headquarters as before at Denver, Colo., succeeding W. J. O'Neill, whose appointment as superintendent motive power of the Western Pacific was reported in the July issue of the *Railway Mechanical Engineer*.

H. W. RIDGWAY, superintendent of motive power of the Colorado & Southern, with headquarters at Denver, Colo., retired on August 1. Mr. Ridgway was born on July 17, 1866, at Delaware Water Gap, Pa., and entered railway service in November, 1881, as a mechanical apprentice on the Denver & Rio Grande, serving in various capacities in the mechanical departments of this company and of the Mexican Central until 1901 when he was appointed superintendent of machinery of the El Paso & Northeastern (now part of the Southern Pacific), later being appointed superintendent of the contract shop. In 1904 he returned to the Mexican Central as superintendent of shops at Aguas Calientes, Mex., and from 1906 to 1913 served as master mechanic on the Colorado & Southern and the Atchison, Topeka & Santa Fe at Denver. At the end of this period he was appointed superintendent of motive power of the C. & S. From 1924 to 1932 he also served as assistant to the superintendent of motive power of the Chicago, Burlington & Quincy.

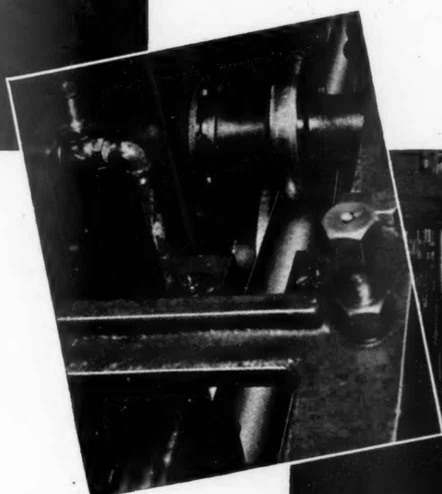
Master Mechanics and Road Foremen

W. P. PRIMM has been appointed assistant road foreman, Baltimore division, of the Pennsylvania.

J. T. SLAVEN, master mechanic of the Coast division of the Southern Pacific, at Bayshore, Cal., has been retired.

(*Turn to next left-hand page*)

What *controlled* atmosphere annealing means . . .



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B. W. JOHNSON, assistant road foreman of engines, Baltimore division, of the Pennsylvania, has been appointed assistant road foreman of engines, New York Division.

A. B. WILSON, master mechanic of the Portland division of the Southern Pacific at Brooklyn, Ore., has been transferred as master mechanic to the Coast division to replace J. T. Slaven.

F. A. SCHILLING has been appointed master mechanic of the Portland division of the Southern Pacific, with headquarters at Brooklyn, Ore., succeeding A. B. Wilson.

M. F. SMITH, enginehouse foreman of the Atchison, Topeka & Santa Fe at Los Angeles, Cal., has been appointed acting master mechanic of the Arizona division, with headquarters at Needles, Cal., succeeding R. Tuck, transferred.

Shop and Enginehouse

H. T. CLARK, road foreman of engines of the Baltimore Division of the Baltimore & Ohio, has been appointed supervisor, locomotive operation, with headquarters at Pittsburgh, Pa., succeeding W. E. Sample.

LAURENCE C. BOWES, general piece work supervisor of the Chicago, Rock Island & Pacific, has been promoted to the newly created position of engineer of shop plants and machinery, with headquarters as before at Chicago. Mr. Bowes was born on June 23, 1890, at Minneapolis, Minn., and received his higher education at Cornell university. He entered the service of the Rock Island in July, 1916, as inspector of stationary boiler plants, serving in this capacity until December, 1922, except for a period during the World War when he was in military service, serving as a private and sergeant overseas. At the end of this period he was promoted to production engineer, and on July 1, 1926, was appointed general piece work supervisor.

Laurence C. Bowes

Purchasing and Stores

GUY O. BEALE, whose appointment as chief purchasing and stores officer of the Chesapeake & Ohio, the New York, Chicago & St. Louis and the Pere Marquette was reported in the August *Railway Mechanical Engineer,* has been connected with the C. & O. for about 26 years. He was born on September 24, 1888, at Ettricks, Va., and after a business college education, he attended the law school of the University of Richmond. He entered the service of the C. & O. in April, 1908, as a clerk in the master mechanic's office, becoming a statistician in the mechanical department in February, 1914. From September, 1917, to June, 1919, Mr. Beale was in military service with the United States Army, then resuming his position with the C. & O. as a statistician in the mechanical department. In March, 1925, he was appointed chief clerk in the mechanical department and in April, 1927, was transferred to the operating department as assistant chief clerk, being appointed assistant chief clerk to the president in April, 1929. In September of the same year Mr. Beale was appointed chief clerk to the late W. G. Black, then mechanical assistant to the president of the C. & O. and the P. M. In November, 1931, when Mr. Black was appointed assistant vice-president (mechanical, purchases and stores), Mr. Beale became his assistant. In April, 1933, when Mr. Black was appointed vice-president in charge of purchasing, stores and mechanical matters of the C. & O., Nickel Plate and P. M., Mr. Beale continued as his assistant, holding this position until his appointment as chief purchasing and stores officer, with headquarters at Cleveland.

Guy O. Beale

E. J. CLARK, chief lumber inspector of the Chicago Burlington & Quincy at Chicago, has been appointed storekeeper at Sheridan, Wyo.

HAL D. FOSTER, purchasing agent of the Colorado & Southern, with headquarters at Denver, Colo., has been appointed also purchasing agent of the Burlington-Rock Island.

Obituary

GERHARDT E. FLUTH, division storekeeper on the International-Great Northern, with headquarters at San Antonio, Tex., died on July 29 in that city, at the age of 44 years.

BERNARD J. FEENY, traveling engineer of the Memphis Division of the Illinois Central, with headquarters at Memphis, Tenn., died on May 31 after an illness of several months. Mr. Feeny was born on November 21, 1875, in Chicago. He began his railroad career on October 11, 1895, as a locomotive fireman on the Chicago Terminal. Three years later he became an engineer and in 1903 was promoted to the position of traveling engineer of the Kentucky division, with headquarters at Paducah, Ky. On July 14, 1913, he was transferred to the Memphis Terminal at Memphis as traveling engineer. On June 16, 1918, he was appointed supervisor of fuel conservation—director of operation, United States Railroad Administration, Southern Region, with headquarters at Atlanta, Ga., and on March 1, 1920, when the railroads were turned back to private ownership, he returned to Memphis as traveling engineer. In 1923 he served as a member of the Examination Board on Rules in the Transportation Department, and from August 16, 1926, to February 15, 1930, was superintendent of fuel conservation, Illinois Central System, with headquarters at Chicago. Mr. Feeny was an authority on fuel conservation and smoke abatement and a member of the American Railway Fuel Conservation Association and the Traveling Engineers' Association, being president of the latter from 1916 to 1918.

SAMUEL LYNN, superintendent rolling stock, Pittsburgh & Lake Erie at McKees Rocks, Pa., died suddenly on August 9. Mr. Lynn was born at Pittsburgh, Pa., August 2, 1869, and received his education in the public schools of that city. He entered the service of the Pittsburgh & Lake Erie in 1885 as a laborer, advancing as car repairman, car inspector, shop inspector and gang foreman until September 1, 1893, when he became foreman of passenger cars at the Pittsburgh terminal. He was promoted to the position of master car builder September 1, 1908, with offices at McKees Rocks, remaining in that position until February 1, 1927, when he was appointed superintendent of rolling stock. Mr. Lynn was for many years active on committees of the Master Car Builders' Association and its successor, the Mechanical Division of the A. A. R. He had been chairman of the Committee on Loading Rules since 1928. It has always been difficult to make a satisfactory report for this committee on the floor of the convention because of its great detail. Mr. Lynn, however, was unusually successful in making an intelligent, clean-cut presentation.

Samuel Lynn